Heating Piping & Air Conditioning

MAY 1954

INDUSTRIAL • COMMERCIAL • INSTITUTIONAL • PUBLIC BUILDINGS

Page 155—Journal Section of The American Society of Heating and Ventilating Engineers

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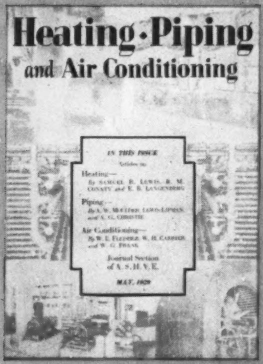

Heating·Piping
and Air Conditioning

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Piping—

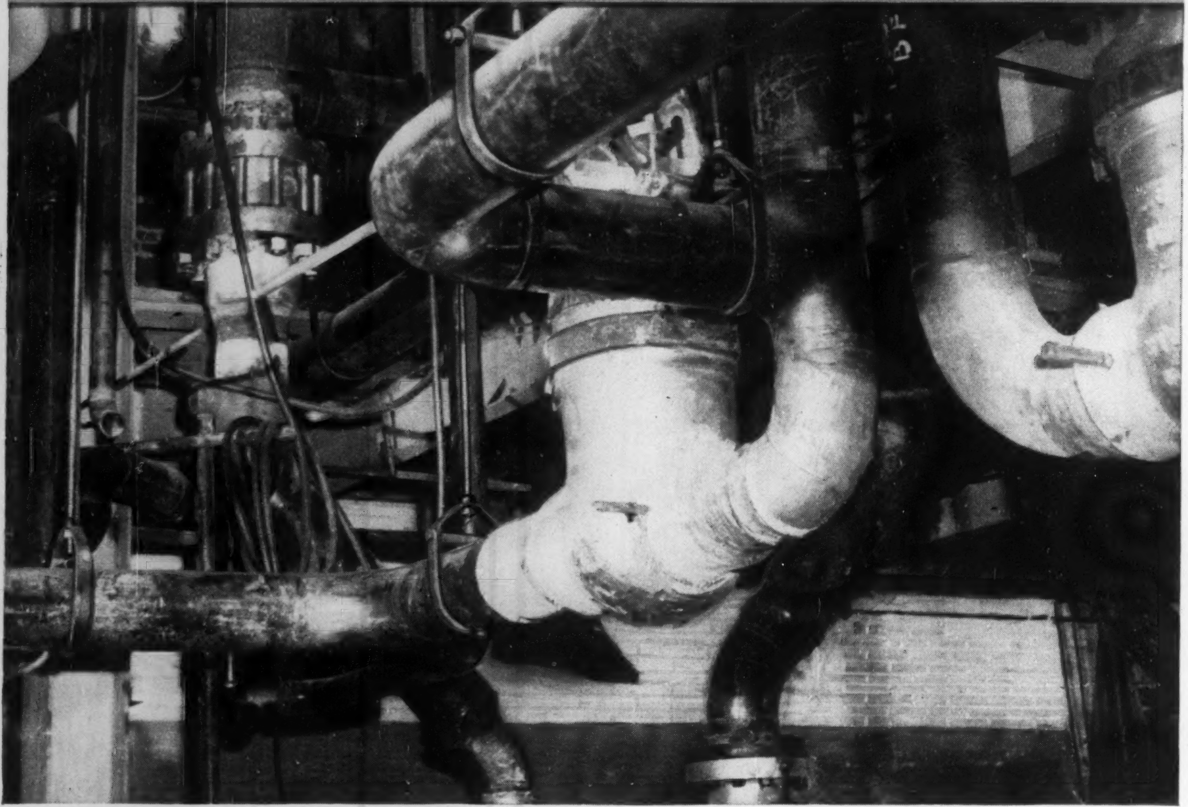
Air Conditioning—

Journal Section
of A.S.H.V.E.

MAY, 1929

HPAC MARKS 25th YEAR

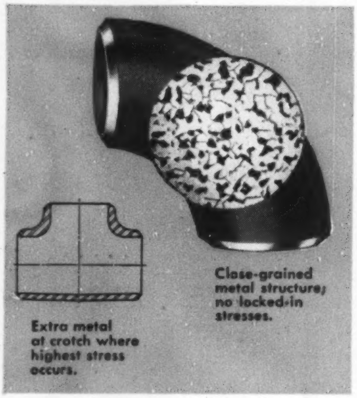
STRONGER THAN PIPE



Boiler feed discharge piping shown under construction above will operate at 2700 psi and 430° F.

Grinnell Welding Fittings

exceed bursting strength of seamless pipe


Close-grained metal structure; no locked-in stresses.
Extra metal at crotch where highest stress occurs.

Grinnell Welding Fittings are designed and processed to have a bursting strength greater than the calculated bursting strength of the seamless pipe to which they are to be welded.

Welding elbows and bends are made from seamless steel pipe by a forging process which produces uniform wall thickness at all points; there is no thinning of outer wall.

Welding tees and crosses are made from seamless pipe by a drawing process which provides extra metal and protection at the crotch, where highest stress occurs.

All Grinnell Welding Fittings are process stress-relieved, thus improving grain structure and increasing the strength of the metal.

With all Grinnell Welding Fittings, you get true circularity; smooth, clean inside surface; full, effective radius; easy, sweeping turns; accurate bevels; and true included angles. Available in a wide range of types and sizes, metals and alloys. Send for descriptive catalog.

GRINNELL
WHENEVER PIPING IS INVOLVED

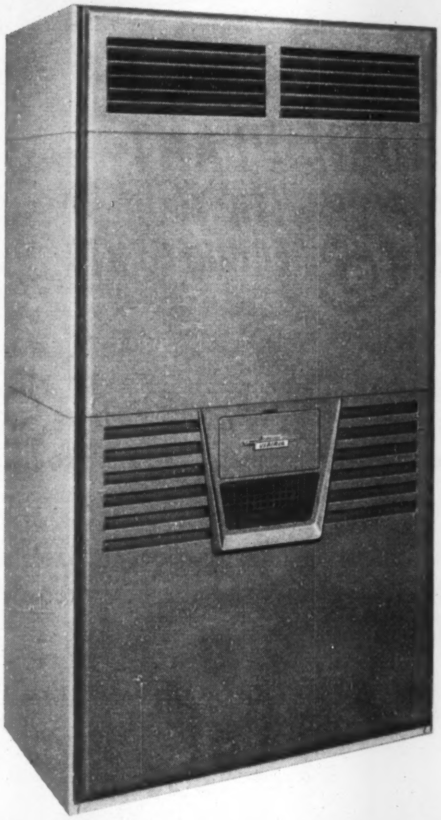
Grinnell Company, Inc., Providence, Rhode Island • Coast-to-Coast Network of Branch Warehouses and Distributors

pipe and tube fittings • welding fittings • engineered pipe hangers and supports • Thermolier unit heaters • valves
Grinnell-Saunders diaphragm valves • pipe • prefabricated piping • plumbing and heating specialties • water works supplies
industrial supplies • Grinnell automatic sprinkler fire protection systems • Amco air conditioning systems

usAIRco

Packaged air conditioners cool Seascape "Motels within a Motel"

Seascape
Air
Conditioned



6 usAIRco packaged air conditioners, self-contained water cooled units, cool the five individual guest buildings plus lobby and coffee shop of the Seascape Motel, Miami Beach, Florida. One 7½ hp. unit is located in each of the 10-room guest buildings, while one 7½ hp. conditioner cools the lobby and coffee shop.

usAIRco's unusually flexible packaged air conditioner cleans, cools and dehumidifies the air. The assemblage consists of three component sections—conditioner, blower and plenum permitting rearrangement in the field to fit any problem. All three sections bolt together easily with rubber gasket to insure airtight seal. Spring mounting insures noise-free compressor operation. The central control panel simply flips down to give convenient access to every control.

The cabinet is a handsome modern design of 2-tone baked enamel hammerloid finish with rugged angle iron frame construction, entirely bonderized for longer life. The usAIRco packaged air conditioner occupies little floor space and comes complete with internal water piping, ready for connection to city water supply or cooling tower. The compressor motor is warranted for five years. All other parts carry a one year warranty.

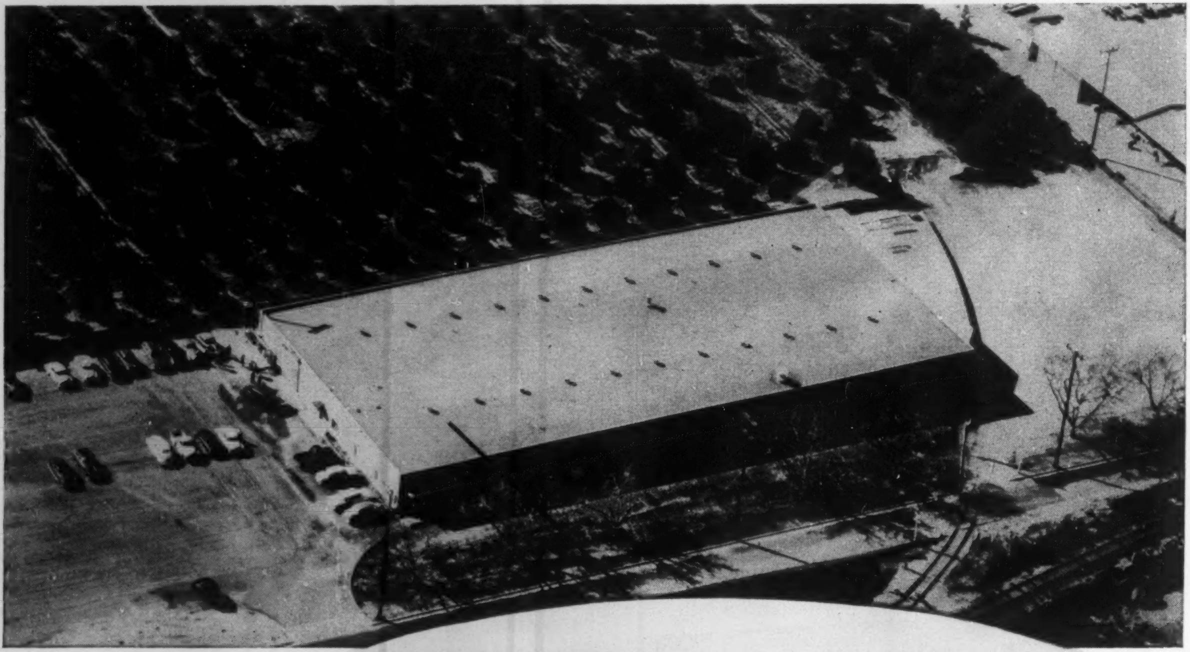
By adding a heating coil, the unit provides effective year 'round air conditioning. The usAIRco packaged air conditioner is easily installed, with or without ductwork. In 6 sizes, from 2 to 15 hp., the unit is the ideal application for motels, offices, theaters, stores, beauty shops and restaurants. Contractor for the Seascape installation was George Winston Construction Co. Air Conditioning Contractor was Airko Air Conditioning Co. of Miami Beach.

For complete descriptive Bulletin 77-5 write Dept. HP-54

UNITED STATES AIR CONDITIONING CORPORATION

MINNEAPOLIS 14, MINNESOTA • *Export: 13 E. 40th Street, New York 16, N. Y.*

usAIRco
30 YEARS OF AIR CONDITIONING



IN CALIFORNIA...

A NEW BUSH PLANT

TO KEEP PACE WITH YOUR GROWING REQUIREMENTS

We are pleased to announce the opening of our new plant at 1850 Massachusetts Ave., Riverside, California. Here, modern production facilities will help us meet the increasing West Coast demand for heat transfer products by BUSH and HEAT-X.

In our expanding industry, it is the manufacturer's obligation to back up his customers . . . provide them with the delivery and service they require. Our new plant was erected to help us fulfill this obligation.

We are glad to supply these facilities and appreciate the patronage that made them possible.

BUSH

BUSH MANUFACTURING COMPANY
WEST HARTFORD 10, CONNECTICUT

Heating Piping & Air Conditioning

Vol. 26 No. 5

(with which is merged the Aerologist)

DESIGN, INSTALLATION, OPERATION AND MAINTENANCE IN INDUSTRIAL, COMMERCIAL, INSTITUTIONAL AND PUBLIC BUILDINGS

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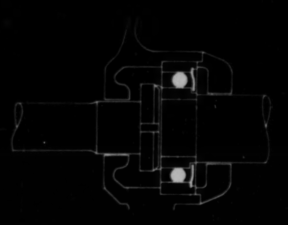
Here's another reason why

the NEW L.A. *Line*

by the Louis Allis Co.

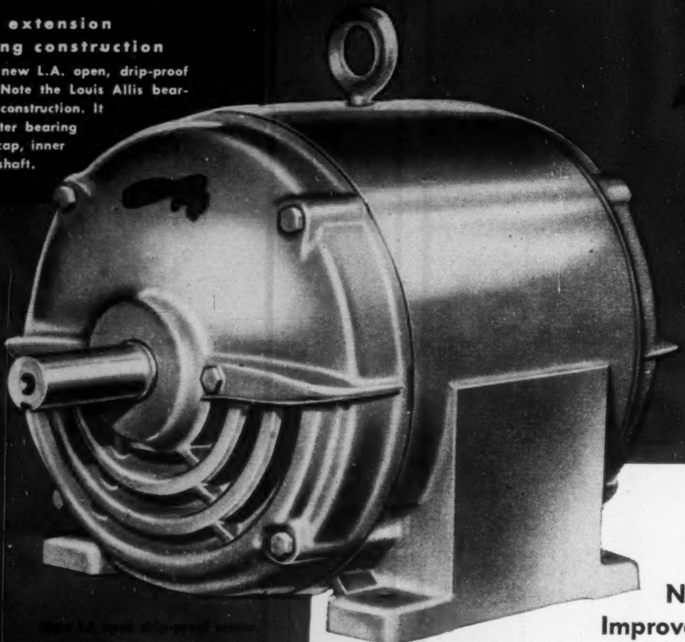
is your BEST

electric motor BUY



Shaft extension bearing construction

used in new L.A. open, drip-proof motors. Note the Louis Allis bearing-cap construction. It locks outer bearing race to cap, inner race to shaft.



New L.A. open drip-proof motor

A brand-new power package, completely redesigned inside and out

with NEW BEARING CONSTRUCTION

plus

New modern styling

More compact design

New conduit box arrangement

Improved ventilation and better protection

More versatile mounting

HERE'S the locked bearing construction that makes the new L.A. motors even better—gives them extra life, extra dependability. It positions the rotor . . . limits shaft end-play . . . gives you ample V-belt drive capacity. You get factory prelubrication, too, with a new, improved grease-retaining system that saves servicing and maintenance — for years of attention-free operation under most conditions.

That's not all! You get standard bearings in every unit — sizes specially selected to be easily obtainable from local stocks. And there's no need to tear the motor down to get bearing numbers — they're stamped right on the new motor nameplate.

Add this modern, dependable bearing construction to all the other features and you see why the L.A. line is your best motor buy. Get the complete story from your nearby Louis Allis Sales Engineer.

We specialize in

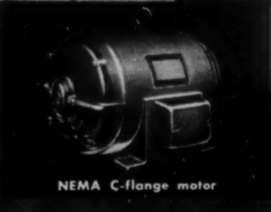
SPECIAL MOTORS *and*

PROMPT DELIVERY, TOO

There's a Louis Allis special motor for your toughest application. Whatever electrical or mechanical modifications you need, check first with Louis Allis.

Vertical NEMA C-flange motor

NEMA D-flange motor



NEMA C-flange motor

THE LOUIS ALLIS CO.

MILWAUKEE 7, WISCONSIN

LA-105

Here's Your Proof!

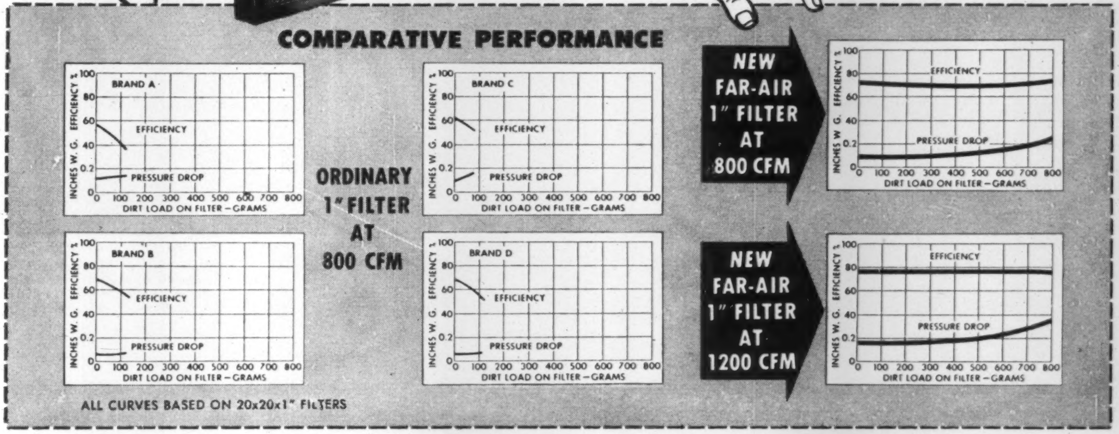
NEW FAR-AIR®

High-Low Velocity 1" FILTER

—holds 7 times as much dirt as ordinary filters

—gives sustained high performance with low pressure loss

—can be used at either high or low velocity



These graphs show actual performance of the new FAR-AIR High-Low Velocity 1" Filter as compared to performance of ordinary types under identical conditions. In addition, it delivers half-again as much clean air because of 50% greater capacity.

Permanent, scientifically designed and ruggedly built, it eliminates the necessity for never-ending replacements. No longer need you put up with poor performance as ordinary 1" filters approach the useless point.

Because it loads progressively, it gives you high efficiency air filtration without critical pressure loss right up to cleaning time. Cleaning is simple and easy. With reasonable care it will last indefinitely.

Here at last is the new-type filter all industry has been waiting for. It means higher quality performance from ⅓ less space, with literally negligible service requirements.

Eliminate the wasteful expense of inefficient filters —save time and trouble—get better air filtration at lower cost. Write today for complete information. Farr Company, P. O. Box 10187, Airport Station, Los Angeles 45, California.

Better by FARR — Better buy FARR

ORIGINATORS OF FAR-AIR CERTIFIED FILTER SERVICE

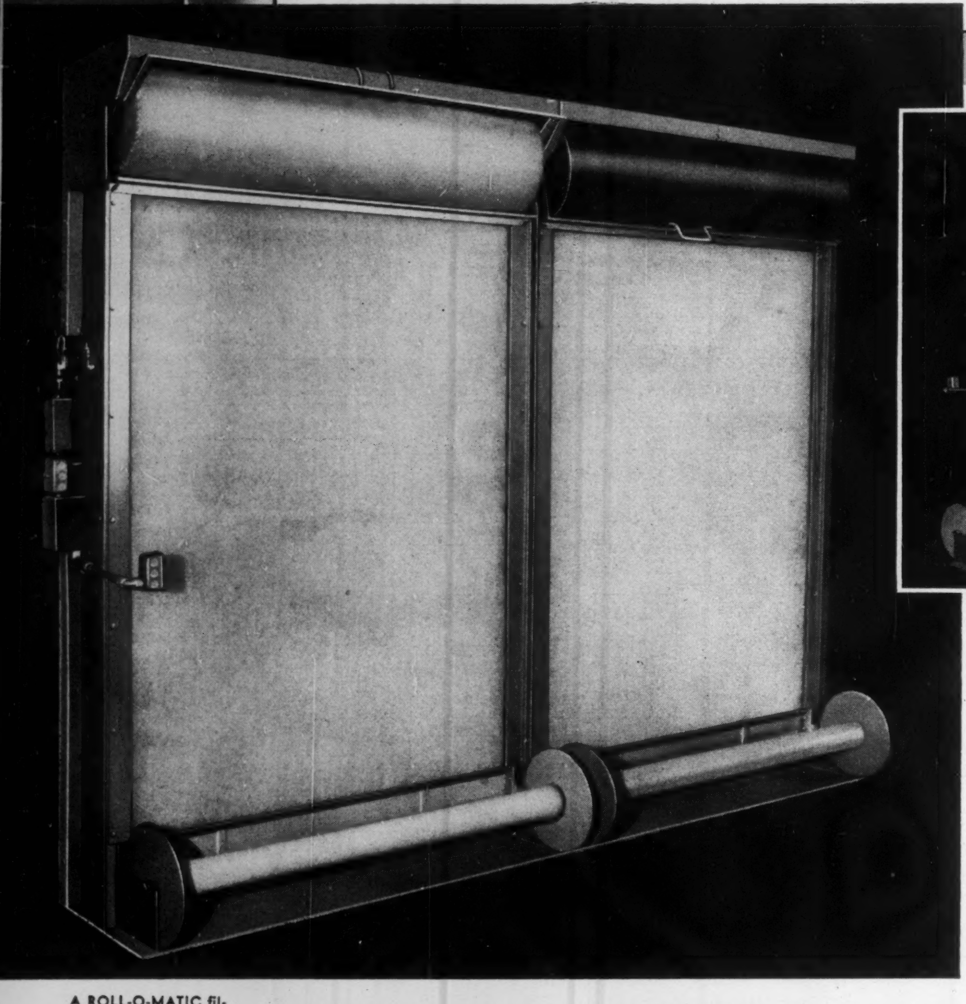
FARR COMPANY

NO COMPROMISE ON QUALITY

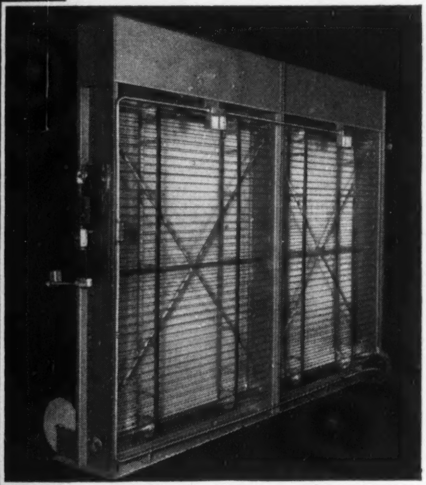
Los Angeles, New York, Chicago, Memphis

MANUFACTURED UNDER LICENSE BY FARR COMPANY MANUFACTURING LTD., MONTREAL, CANADA

INTRODUCING THE *NEW*

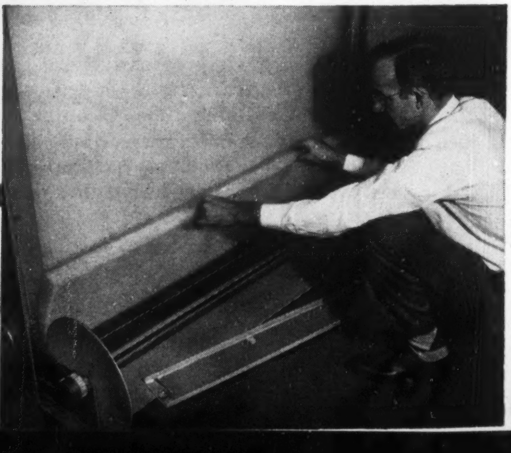


A ROLL-O-MATIC filter of two 5'0" wide by 8'0" high sections —capacity 26,700 cfm.



Rear view of ROLL-O-MATIC showing simplicity of design which leads to lightweight and easy installation.

Single motor provides power for both introducing clean media and rewinding the soiled portion it replaces—will operate a maximum of 3 to 6 sections depending on height.



Just like putting film in a camera! End of AMER-*glas* is attached to motor-driven spool at bottom of filter, which re-rolls soiled media for later disposal.

Roll-O-MATIC

ANOTHER AAF ENGINEERING *FIRST*

A "Dry" Type Viscous Air Filter That Maintains Its Efficiency Automatically Up To One Year With One Roll of Low-Cost AMER-glas Media

Imagine a high efficiency "dry" type automatic air filter capable of maintaining its established operating resistance for months on end without an hour lost or dollar spent on maintenance! The new AAF ROLL-O-MATIC can and will—and does it in the simplest, most saving way ever devised.

FEATURES AMER-GLAS FILTER MEDIA

The ROLL-O-MATIC is a viscous filter with "dry" type characteristics—combines the efficiency and simplified maintenance of a dry filter with the high dust holding capacity and velocity characteristics of a viscous filter. Its filtering media, called AMER-*glas* is a 2″ thick resilient mat made up of continuous glass fibres held together by a high temperature plastic bond, and sprayed with a special non-flammable Viscosine fluid-jell. The ROLL-O-MATIC mat is made in continuous lengths up to 70 feet.

ROLL-O-MATIC PRINCIPLE MAINTAINS UNIFORM RESISTANCE AUTOMATICALLY

The AMER-*glas* media, rolled on a spool, is installed in the ROLL-O-MATIC just like the film in a camera. With the roll mounted at the top of filter, the media, moving as a continuous curtain down the face of the filter, is re-rolled automatically at the bottom on an empty spool which is rotated by a motor operating through a simple reduction gear and chain drive.

Media usage is in direct proportion to the dust content of the air, in that movement of curtain is regulated by a pressure switch which measures its resistance to air flow. As the filtering curtain accumulates dust, the resistance to air flow rises—and when it reaches a predetermined point, the pressure switch actuates the drive motor. Clean media is introduced automatically in sufficient quantity to lower resistance to its original operating level—and the dust-laden media is re-rolled for later disposal. In brief—the ROLL-O-MATIC operates at top efficiency day in and day out without your even raising a hand to press a button.

While media usage will, of course, vary with dust loads, field tests indicate that, under normal operating conditions, one roll of AMER-*glas* will be sufficient for one year's operation, per 10,000 cfm of capacity. But regardless of media life—you can enjoy the efficiency and automatic operation of ROLL-O-MATIC for less than the cost of throw-away filters.

OTHER ROLL-O-MATIC ADVANTAGES

The very nature of ROLL-O-MATIC design makes for important weight saving; easy low-cost installation; and eliminates need for oil and water for washing. AMER-*glas* media is underwriters' approved (Class 2). Maintenance, other than installing clean media, is both simple and infrequent.

Here is another AAF Engineering "First"—and by all known standards of air filter performance by far the greatest. For complete design and engineering data on the new ROLL-O-MATIC, call your local AAF representative or write direct for Bulletin No. 248.

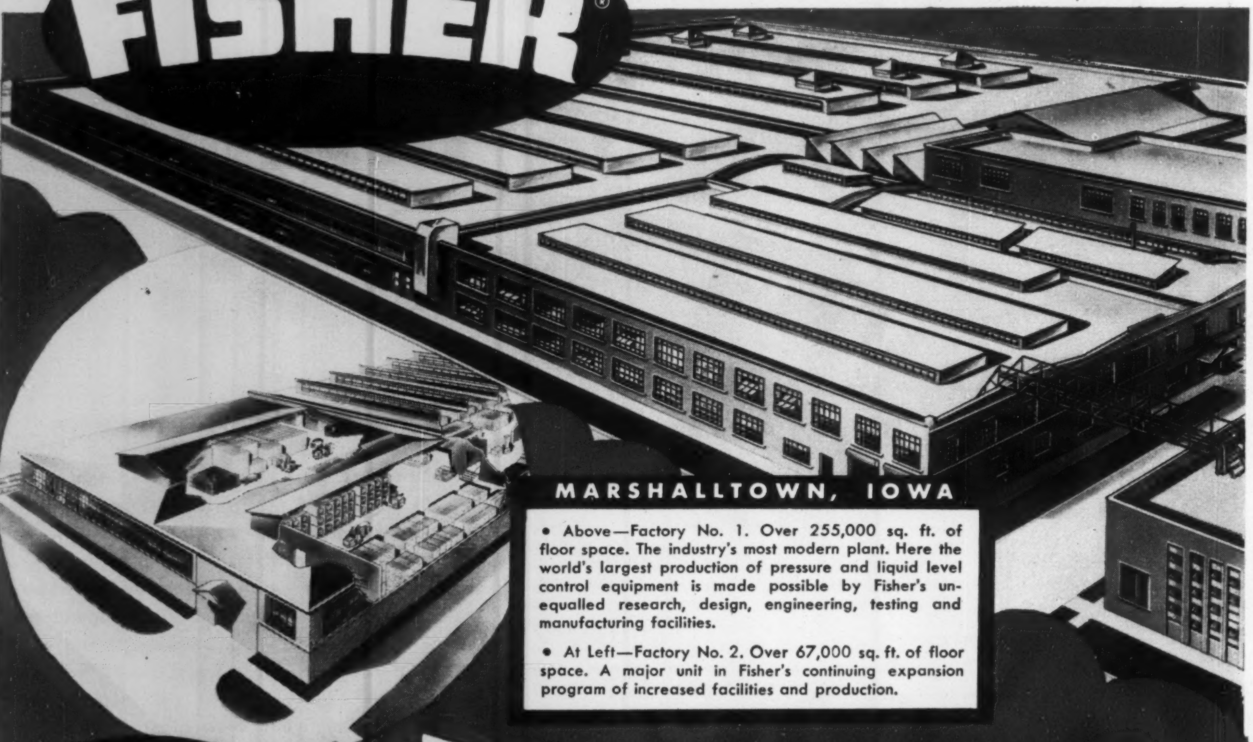
AAF®

American Air Filter

COMPANY, INC.

American Air Filter of Canada, Ltd., Montreal, P. Q. • 373 Central Avenue, Louisville 8, Kentucky

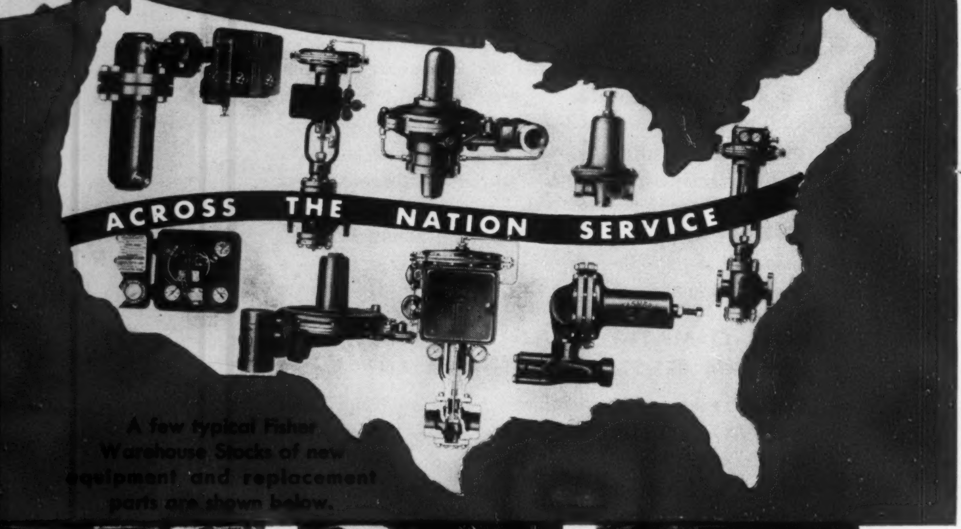
FISHER FACTORIES



MARSHALLTOWN, IOWA

• Above—Factory No. 1. Over 255,000 sq. ft. of floor space. The industry's most modern plant. Here the world's largest production of pressure and liquid level control equipment is made possible by Fisher's unequalled research, design, engineering, testing and manufacturing facilities.

• At Left—Factory No. 2. Over 67,000 sq. ft. of floor space. A major unit in Fisher's continuing expansion program of increased facilities and production.



A few typical Fisher Warehouse Stocks of new equipment and replacement parts are shown below.

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•
GAS REGULATORS
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LIQUID LEVEL CONTROLLERS
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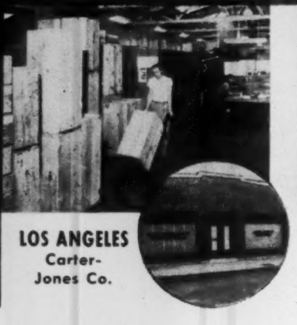
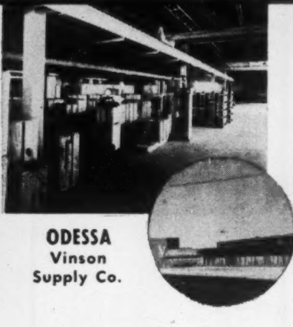
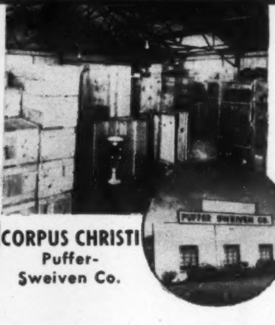
DIAPHRAGM CONTROL VALVES
•
PUMP GOVERNORS
•
LEVER and FLOAT VALVES



LOS ANGELES
Carter-Jones Co.



ODESSA
Vinson Supply Co.

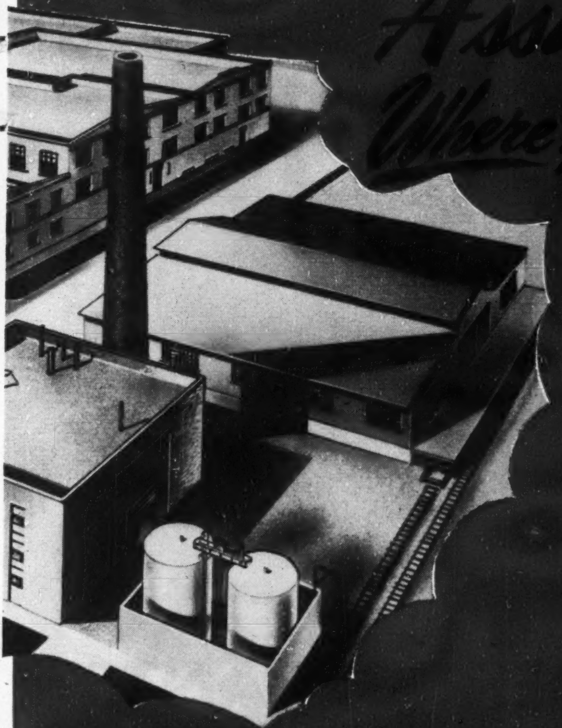


CORPUS CHRISTI
Puffer-Sweiven Co.

AND FIELD STOCKS

Assure You Delivery

Where you want it! When you want it!



YOU SAY WHEN AND WHERE AND WE'LL BE THERE!

You are always close to a source of supply of Fisher control valves, gas regulators, liquid level controllers and pressure regulators.

Whether your problem is one of existing equipment—or an entirely new control application—the Fisher country-wide net-work of 19 *strategically located field stocks* and 49 representatives—with over 200 Fisher Service Engineers—offers you immediate and convenient service on all your control requirements.

FISHER GOVERNOR COMPANY

MARSHALLTOWN, IOWA

WORLD LEADER IN RESEARCH FOR BETTER PRESSURE AND LIQUID LEVEL CONTROL

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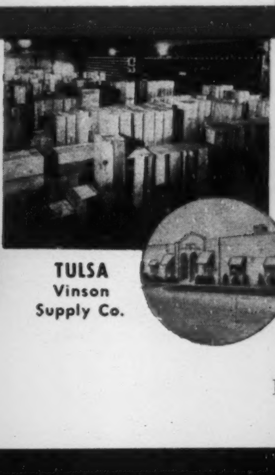
Vinson Supply Co.



TULSA
Vinson Supply Co.

exceptionally low moisture content

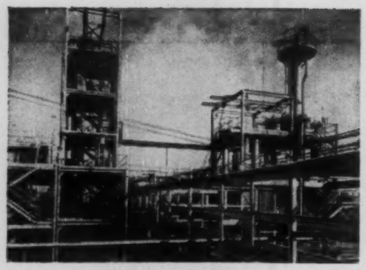
Here's the story about "genetron®" REFRIGERANTS

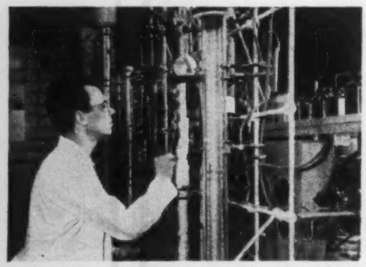
The most important things to be sure of in the refrigerants you use are these: that their moisture content is *always* extremely low . . . that their overall purity *always* meets strict refrigeration standards . . . and that this high quality is *always* maintained, cylinder after cylinder—ton after ton.

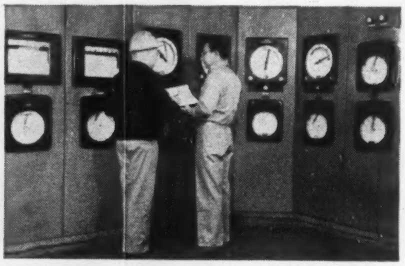
You can rely on "Genetron" refrigerants to measure up on every count—every time . . . and here's why!

First, because General Chemical has over five decades' experience making chemicals of unusually high purity for science and industry . . . actually supplies over 1,000 "precision products" that are certified to meet stringent specifications of America's scientific laboratories.

Second, because General Chemical is a pioneer and leading producer of fluorine compounds, the basic chemicals from which "Genetron" refrigerants are made. That means we *know* the materials behind organic fluorine refrigerants, how to handle them and


Production capacity of General's large new "Genetron" plant is now being tripled—enabling the company to supply industry's future needs most effectively.


"Genetron" refrigerants are products of General Chemical's extensive fluorine research program which has developed over 90 products for science and industry.


The special process used to make "Genetron" refrigerants employs advanced techniques and control methods that assure the exceptionally low moisture content of "Genetron" refrigerants.

outstanding purity

in a nutshell

build into them all the qualities required for use in today's refrigeration and air conditioning equipment. It means we have the mines, raw materials, the equipment and experience to serve the industry's needs effectively now—and in the future.

Third, because "Genetron" refrigerants are made by a special new modern process that guarantees exceptionally low moisture content and outstanding purity in every pound . . . and every ton of "Genetron."

That's the story of "Genetron" refrigerants "in a nutshell"!

. . . That's why you can be confident of getting the finest made, when you order "Genetron" refrigerants!

Always Ask for "Genetron" Refrigerants

For dichlorodifluoromethane—insist on "Genetron" 12 . . . for trichloromonofluoromethane, always ask for "Genetron" 11.

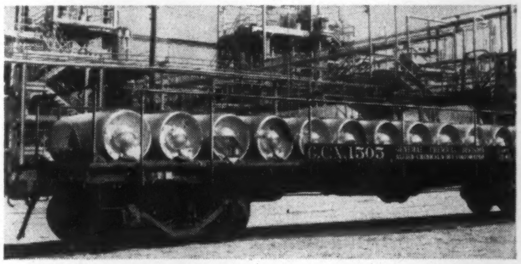
genetron 11

TRICHLOROMONOFLUOROMETHANE

genetron 12

DICHLORODIFLUOROMETHANE

"Genetron" 12 and "Genetron" 11 are identical and interchangeable in all respects with dichlorodifluoromethane and trichloromonofluoromethane produced by any manufacturer meeting the same high refrigerant standards.



Out of the laboratory . . . from our vast sources comes

Purity by the Carload

For Further Information...

Write or 'phone the nearest General Chemical office listed below. Ask for FREE TECHNICAL SERVICE BULLETIN 11.12A on "Genetron" Refrigerants.

Allied Chemical

Products of

GENERAL CHEMICAL DIVISION
ALLIED CHEMICAL & DYE CORPORATION
40 Rector Street, New York 6, N. Y.

Offices: Albany • Atlanta • Baltimore • Birmingham • Boston • Bridgeport • Buffalo Charlotte • Chicago • Cleveland • Denver • Detroit • Greenville (Miss.) • Houston Jacksonville • Kalamazoo • Los Angeles • Minneapolis • New York • Philadelphia Pittsburgh • Providence • San Francisco • Seattle • St. Louis • Yakima (Wash.)
In Wisconsin: General Chemical Company, Inc., Milwaukee
In Canada: The Nichols Chemical Company, Limited • Montreal • Toronto • Vancouver

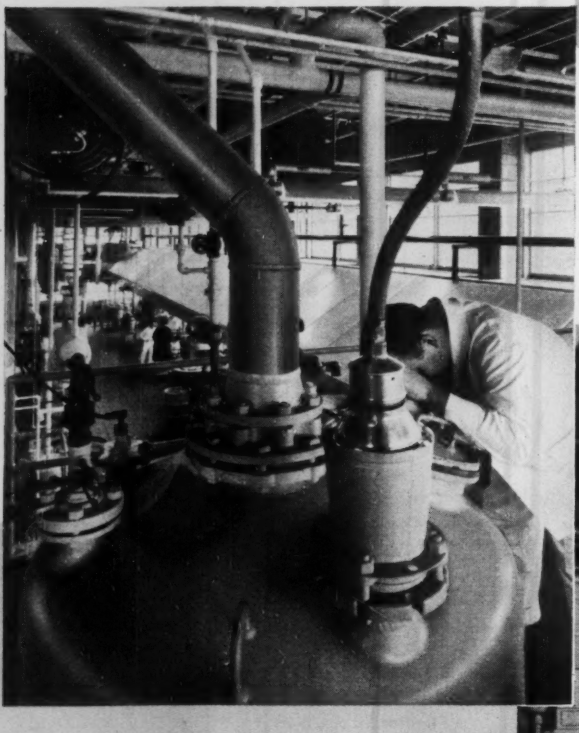
ARMOUR'S NEW LABORATORIES *producing*

Left: **Parenteral Packaging Department.** One of the areas completely air conditioned.

POWERS
TEMPERATURE AND HUMIDITY
CONTROL

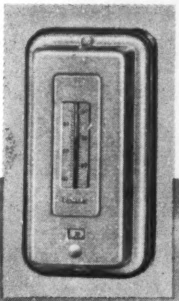
Above: **Hospital Gowned and Masked Technicians in Bulk Sterile Filling Area.** Here the air conditioning is treated in such a manner that aseptic operations could be undertaken with least possibility of bacterial contamination.

Below: **Low Temperature Human Blood Fractionation Plant** — *the largest in the U.S.A.* In this area there are processed 18,000 pints of human blood (or the equivalent of human plasma) weekly into Normal Serum Albumin and Poliomyelitis Immune Globulin. Processes are controlled by Powers V-Port FLOWRITE Valves. This entire room is accurately held at 23° F.



Above: **View in Parenteral Manufacturing Building No. 4** where ACTHAR, Insulin, and Intrinsic Factor (BIO-PAR) are processed. Processes here are also controlled by Powers V-Port FLOWRITE Valves.

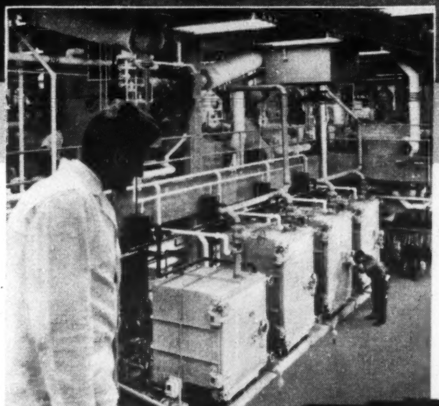
Gamma Globulin and other pharmaceuticals...



Use POWERS AIR CONDITIONING CONTROL AND FLOWRITE DIAPHRAGM VALVES

THE ARMOUR LABORATORIES

New ARMOUR PHARMACEUTICAL CENTER, Near Kankakee, Ill.



Above: View in Solvent Extraction Building No. 5 where Insulin, Intrinsic Factor and Injectable Liver are produced. Processes are controlled by Powers V-Port FLOWRITE Valves.

Architects & Engineers: **HOLABIRD & ROOT & BURGEE**
Piping Contractor: **M. J. CORBOY CORP.**

Gamma Globulin for Combating Polio, Serum Albumin used by the Armed Forces for transfusion in shock and burn cases, Thyroid powder and tablets, Intrinsic Factor (BIOPAR), Insulin and ACTHAR for treatment of arthritis — production of these and many other Armour products requires accurate temperature control.

To insure the precision control of air conditioned areas in their modern $12 million plant Armour installed a Powers pneumatic control system. To accurately control the flow of heating and cooling mediums and vacuum used for various processes, they installed Powers V-PORT FLOWRITE Valves.

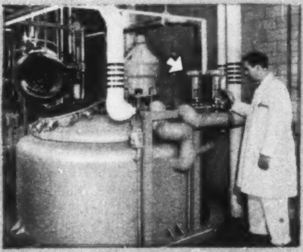
When you have a control problem requiring the dependable performance assured by Powers products — call our nearest office or write us direct.

THE POWERS REGULATOR CO.

SKOKIE, ILL. • Offices in Over 50 Cities in U.S.A., Canada and Mexico

Over 60 Years of Automatic Temperature and Humidity Control

(b70)

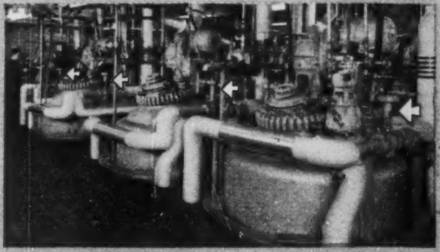


POWERS
FLOWRITE VALVE
TYPE
TO COMPRESS SPR
TURN

Powers FLOWRITE Valve
Characterized V-PORT Type

Gives BETTER Control with Less Maintenance

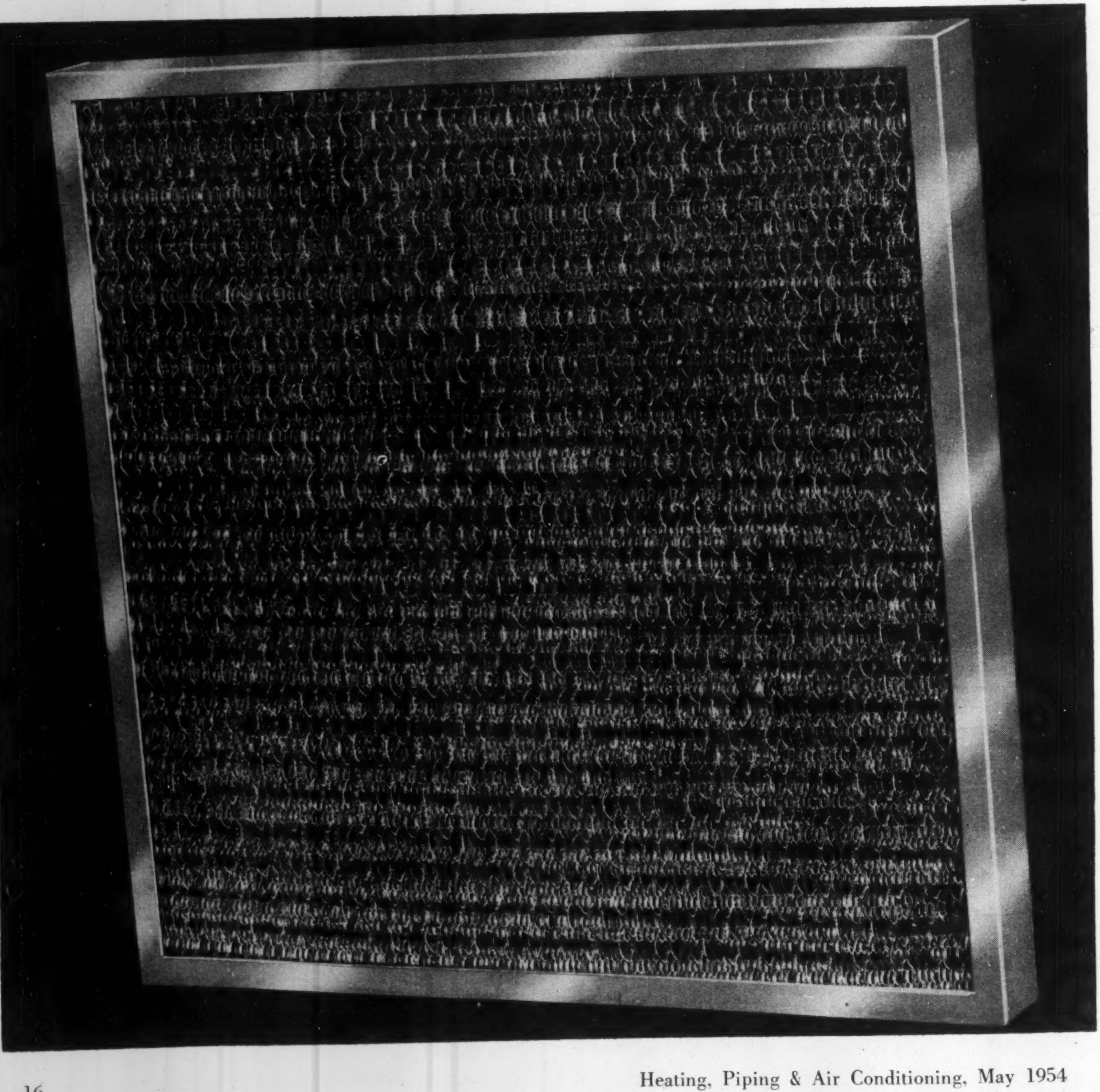
Over 100 are Used in Armour Laboratories.



ACCURATELY CONTROLS STEAM, WATER, VACUUM AND PROPYLENE GLYCOL AT ARMOUR LABORATORIES

Evans

Completely Lifelong



New All Aluminum

AIR FILTER

OPENING AN AMAZING NEW FIELD IN SALES AND PROFITS . . . . PLUS

Guaranteed Territory Protection

Revolutionary New Design!

Filter pack contains a series of machine stamped, all aluminum grids. Every grid precision made for absolutely *exact size openings . . . exact measured corrugations* . . . to produce precision filtering of air. Burr edge on every opening gives extra filtering efficiency. Top aluminum stamped grid designed has larger openings to prevent matting of lint. The FIRST all aluminum filter with every part *originally created for filtering of air only.*

Revolutionary New Performance!

Less resistance to air flow than ever thought possible. More controlled turbulence to trap dust. Air must travel more than double the thickness of filter from inlet side to outlet side. Every side and angle of filter grid scientifically designed to present more area and sharper edges for gathering and holding dust. *Lower resistance to air flow permits greater coil efficiency than heretofore thought possible.* Saves fuel. Filters last a lifetime. Used dry or with oil. Can be *cleaned* "clean" in a few minutes with hot water and used over and over again for years and years.

Greater Profits Per Unit!

The Evans Merchandising Policy is something completely new. It protects distributors, jobbers and dealers on sales. In fact it GUARANTEES this protection. If you are now handling an old-fashioned line of filters which is not giving you adequate profits, adequate customer satisfaction and adequate territory protection, then by all means get the complete Evans story on both this new lifetime filter and the new Merchandising Policy. It positively has no equal.

INVESTIGATE NOW! MAIL THIS COUPON TODAY!

THE GEORGE EVANS CORPORATION, MOLINE, ILLINOIS

GENTLEMEN: Please send me: ☐ **Descriptive Literature** ☐ **Merchandising Policy** ☐ **Price Lists**

I WANT TO LEARN HOW TO MAKE MORE MONEY OUT OF THE FILTER BUSINESS.

NAME ____________________ **COMPANY** ____________________

ADDRESS ____________________

CITY ____________________ **STATE** ____________________

NOW! the new Modine

A modern room unit for cooling and heating hotels, apartments, motels, offices, hospitals, schools, homes. Ideal for new construction and modernization.

THE new Modine AIRditioner* provides cooling with chilled water, heating with hot water . . . filters, dehumidifies, circulates and introduces fresh outside air. All functions are subject to individual room control. Here is healthful summer-winter comfort for multi-room installations within reach of the most modest air conditioning budget.

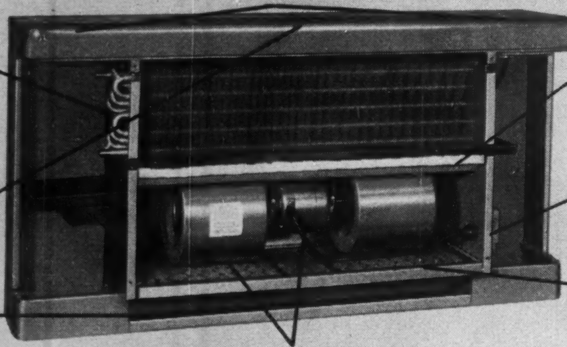
Modine AIRditioner design assures excellent performance on cooling or heating plus unusually quiet operation. Four-speed motor control provides maximum flexibility in meeting comfort requirements.

Choose from four types: The beautiful Console (illustrated) for exposed or partially recessed installation . . . the Concealed . . . and the Overhead types with and without casings. Each type is available in three sizes rated at 2/3, 1-1/2 and 2 tons of refrigeration (220, 440 and 640 cfm respectively).

Distinctive appearance and versatility are combined in the Console type styled by Jean Otis Reinecke, nationally known designer. This unit may be installed against a wall—or recessed to a depth of 5 inches, leaving less than 6 inches exposed in the room. Use of square edges at junctions of top and sides eliminates need for cutting rounded contours in wall recess . . . or preparing specially formed trim strips. Square edges blend gracefully into rounded corners in forward part of top.

Modine AIRditioners are Parker-Bonderized and finished in a semi-gloss Marine Green primer selected for high resistance to humidity. The factory finish is so attractive that further decorative treatment will frequently be unnecessary.

*Trademark



Access doors are provided on both ends of unit to allow reversal of motor control location. Alternate door usable for water-flow or other controls.

High-capacity coil has brass tubes, electro-plated for protection against electrolysis with aluminum fins. All tube-joints are brazed. Coils are reversible for right or left-hand piping connections.

Outlet grill is integral part of 18-gauge cabinet top. Adjustable louvre grill optional at extra cost.

Manually adjusted fresh air damper for regulation of fresh and recirculated air mixture.

Quiet operation is assured by ample use of glass fiber insulation plus sound-deadening mastic throughout. In addition, fans and motor are resiliently suspended.

All electrical connections within cabinet reversible.

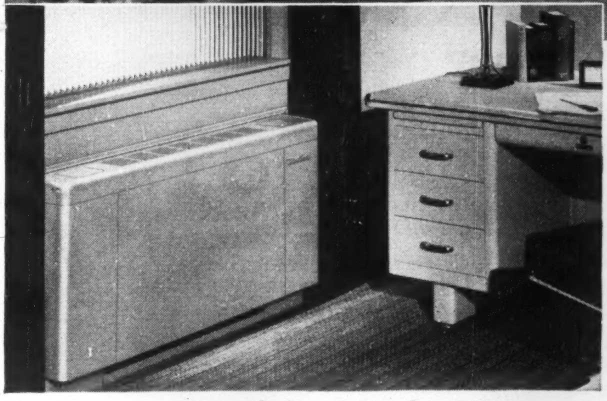
Air filter readily removed for cleaning or replacement. Access to filter by manually removable front panel. No tools needed.

Motor and fan assembly easily removed as unit by taking out four bolts and disconnecting electrical plug.

CONSOLE TYPE WITH FRONT AND END PANELS REMOVED

Modine Airditioners

AIRditioner



(Above) Console type is installed against finished wall. A ⅜-in. thick sponge rubber strip around perimeter of back serves as wall seal and as plenum for fresh air inlet. All piping and wiring are concealed in enclosure.

(Left) Because all rear corners are square, AIRditioner can be recessed faster, at lower cost. With over-all depth less than 11 in. and up to 5 in. of recessing permissible, AIRditioner takes far less floor space.

Concealed and Overhead Types

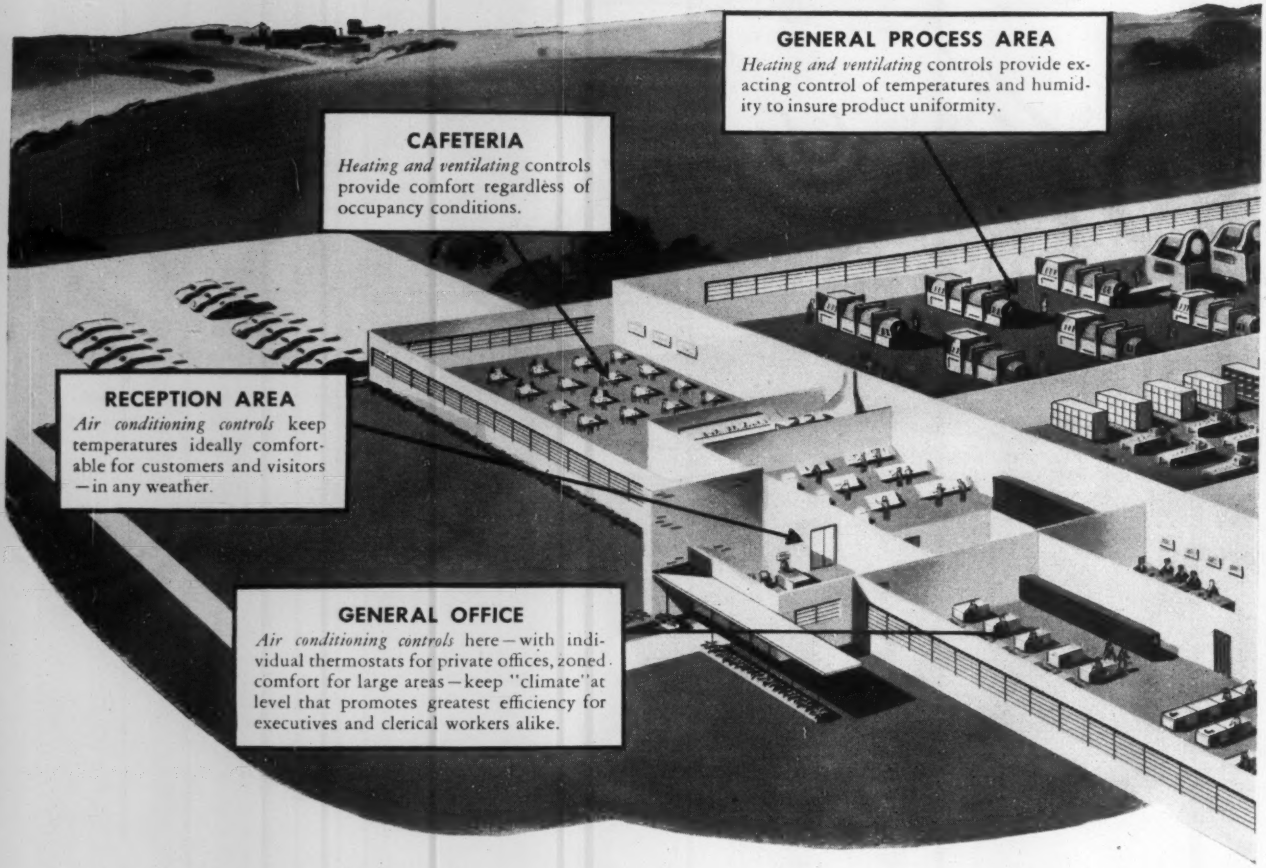
Other AIRditioners available include: Concealed type for built-in installation behind a finished wall. Overhead type with casing for exposed ceiling installation. Overhead type without casing for use with ducts above a false ceiling or in a closet.

MODINE MANUFACTURING COMPANY
1509 DeKoven Ave., Racine, Wis.

Please send me a free copy of bulletin describing the new Modine AIRditioner.

Name ....
Position ....
Firm ....
Address ....
City ....Zn ....State ....

A-1223



GENERAL PROCESS AREA
Heating and ventilating controls provide exacting control of temperatures and humidity to insure product uniformity.

CAFETERIA
Heating and ventilating controls provide comfort regardless of occupancy conditions.

RECEPTION AREA
Air conditioning controls keep temperatures ideally comfortable for customers and visitors—in any weather.

GENERAL OFFICE
Air conditioning controls here—with individual thermostats for private offices, zoned comfort for large areas—keep "climate" at level that promotes greatest efficiency for executives and clerical workers alike.

How Honeywell Customized Temperature Control Can Raise Industrial Efficiency

Take two of the most important factors in business today: employee work-output and product quality.

There's good evidence that on both counts the efficiency of a plant could be considerably improved by proper installation of Honeywell Controls.

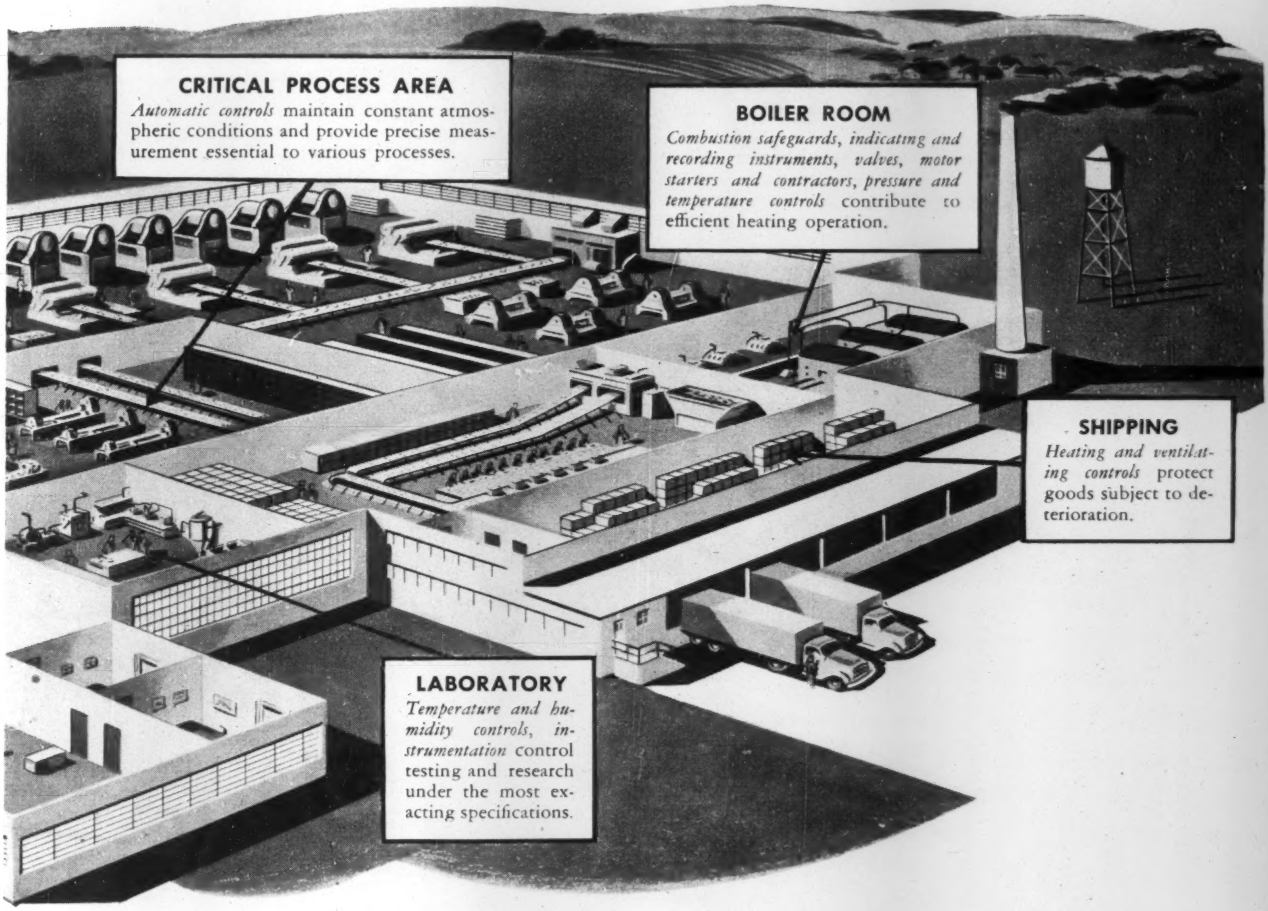
As for the amount of work employees do . . . scores of plants throughout the country have greatly boosted efficiency—by protecting workers' health, increasing their comfort, making them happier.

One of the primary ways this was done was through the use of Honeywell Customized Temperature Control installations in areas like those above. By compensating for such varying factors as weather, exposure, occupancy, internal heat sources and type of building construction, Honeywell Controls have greatly improved working conditions.

Or consider the realm of product quality . . .

Honeywell control installations in industrial centers have helped improve products, often have made possible a much greater degree of uniformity. These controls for temperature, humidity and process instrumentation are in daily use by industries as divergent as pickle packers and uranium processors, paper manufacturers and steel fabricators.

And in many cases, Honeywell Customized Control installations are saving businesses thousands of dollars yearly through more economical use of fuel.



CRITICAL PROCESS AREA
Automatic controls maintain constant atmospheric conditions and provide precise measurement essential to various processes.

BOILER ROOM
Combustion safeguards, indicating and recording instruments, valves, motor starters and contractors, pressure and temperature controls contribute to efficient heating operation.

SHIPPING
Heating and ventilating controls protect goods subject to deterioration.

LABORATORY
Temperature and humidity controls, instrumentation control testing and research under the most exacting specifications.

For Comfortable, Even Temperature in New or Existing Buildings—of any size—Use Honeywell Customized Temperature Control

Whether it's a factory, school, office, hospital, apartment, store, garage — or any size building — new or existing, Honeywell Customized Temperature Control can help meet your clients' heating, ventilating, air conditioning and industrial control problems.

Once equipped with Honeywell Customized Temperature Control, they'll have an ideal indoor "climate"— and save fuel besides.

And with a complete line of pneumatic, electric and electronic controls to choose from, Honeywell Customized Temperature Control offers you the greatest flexibility in design. Then, too, when it comes to performance, Honeywell-built controls assure years of trouble-free operation. And they're backed by the finest service organization in the controls industry.

For full facts on Honeywell Customized Temperature Control, call your local Honeywell office. There are 112 across the nation. Or mail the coupon today.

MINNEAPOLIS
Honeywell

First in Controls

12 OFFICES ACROSS THE NATION

MINNEAPOLIS-HONEYWELL REGULATOR CO.
Dept. HA-5-58, Minneapolis 8, Minnesota

Gentlemen.

I'm interested in learning more about Honeywell Customized Temperature Control.

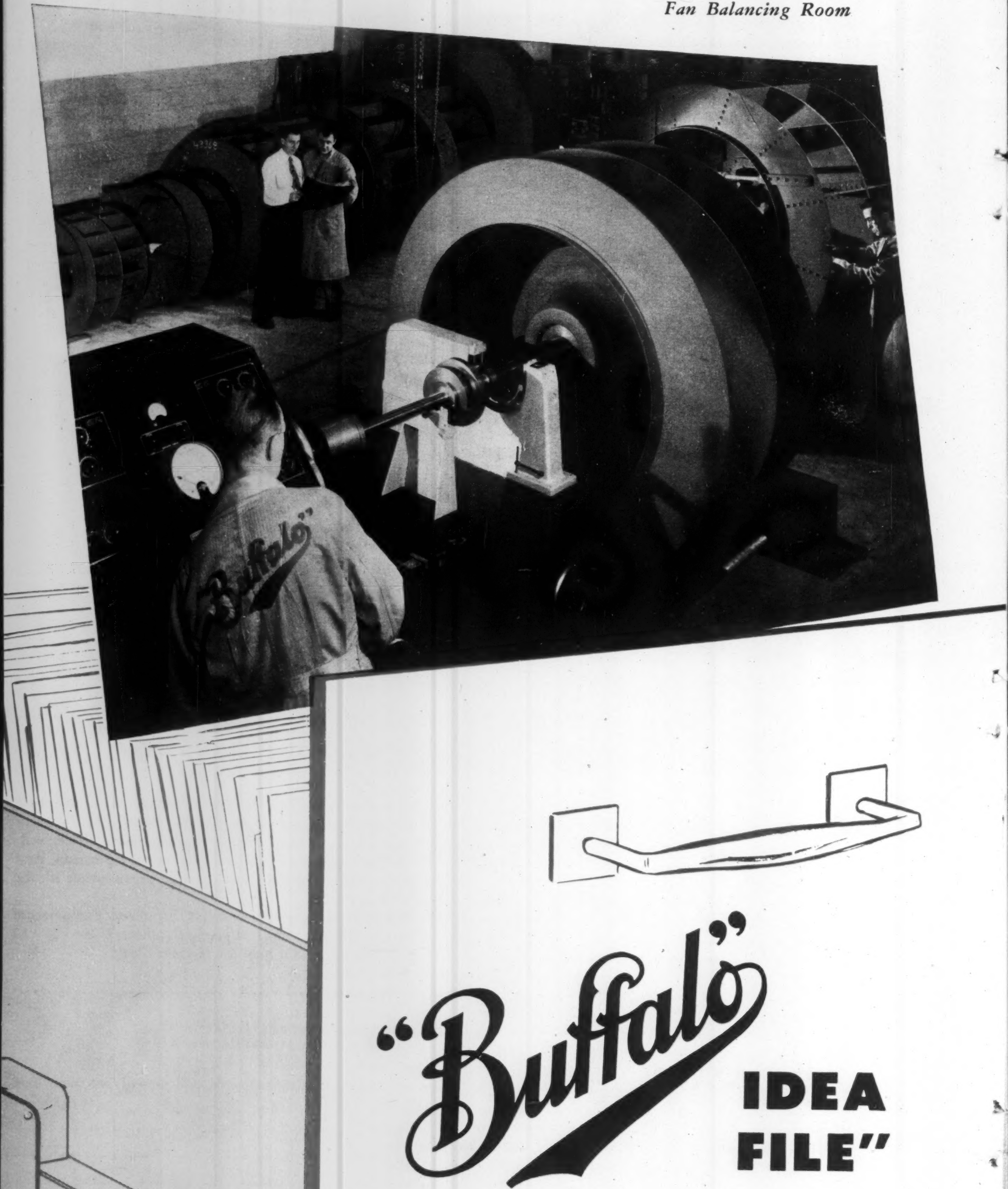
Name ....

Firm Name ....

Address ....

City .... *Zone* .... *State* ....

In The "Buffalo"
Fan Balancing Room


"Buffalo"
49369

"Buffalo" IDEA FILE"

THE IMPORTANCE OF MAINTAINING BALANCE OF FAN WHEEL

PROBLEM:
excessive vibration in exhaust fan delivering dust-laden air to cyclone. Fan operated smoothly a number of years, but gradually developed vibration and finally damaged the bearings.

SOLUTION:
Fan Wheel found to be far out of balance due to uneven buildup of slightly moist dust particles on blades. Fan rotor had never been cleaned, and had condition been permitted to continue, further bearing troubles and a sprung shaft might have resulted. "Buffalo" representative advised owner to clean rotor every six months, then check wheel balance. Fan has since operated smoothly, with no further bearing trouble, and at greatly reduced noise level. NOTE: all "Buffalo" fan rotors are balanced both statically and dynamically on precision balancing machines at the factory. Regular periodic cleaning and repainting followed by a balance check will assure added years of smooth, efficient performance.

This is one of thousands of problem-solution case histories accumulated in "Buffalo" files during our 77 years of building air handling equipment and solving air problems for industry. Call your nearest Buffalo Engineering Sales Representative—get the benefit of his factory-trained "know-how" and experience to help you solve your air problems.

Write for Maintenance Data Booklet 3426

BUFFALO FORGE COMPANY

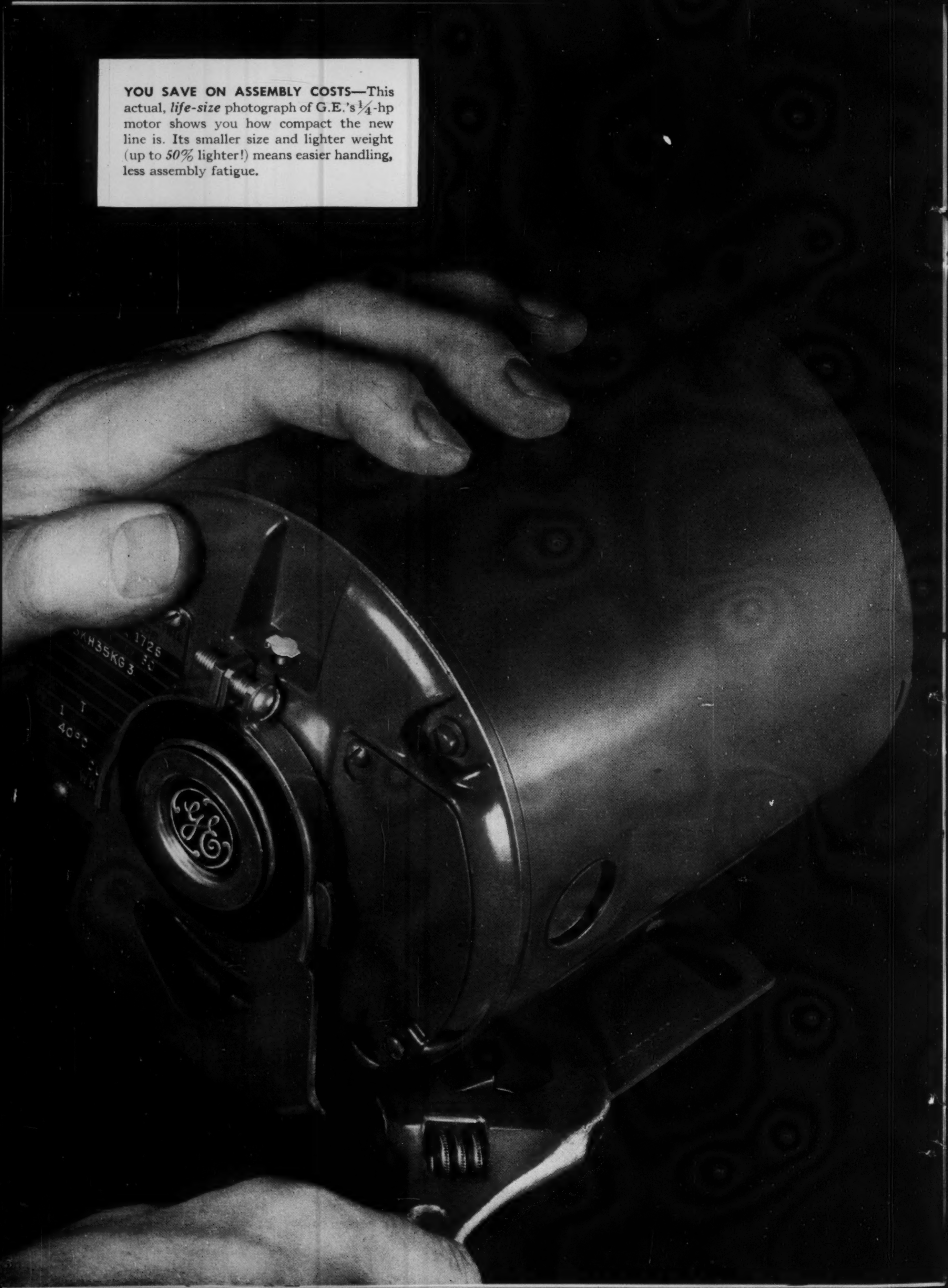
171 MORTIMER STREET BUFFALO 4, N. Y.

Publishers of "Fan Engineering" Handbook

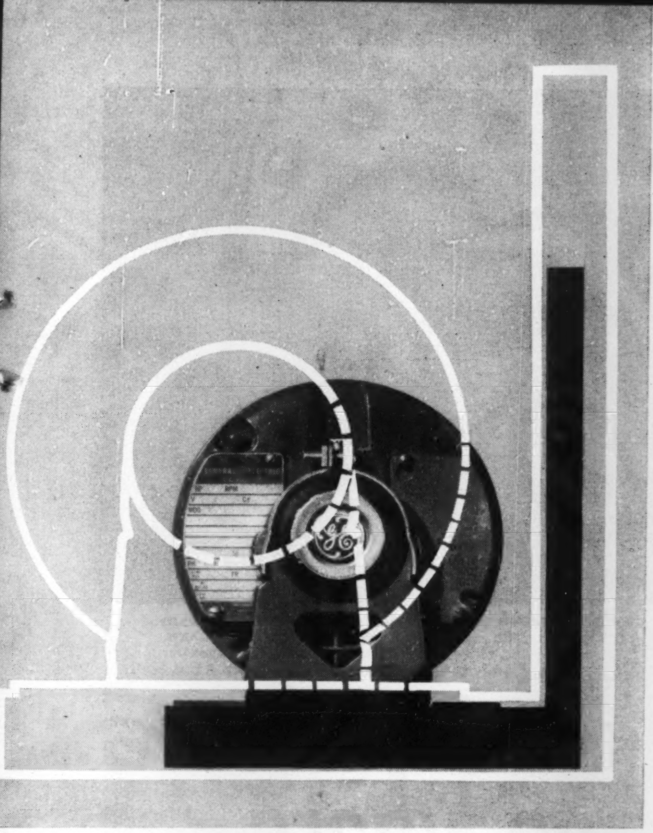
Canadian Blower & Forge Co., Ltd., Kitchener, Ont.

Sales Representatives in all Principal Cities

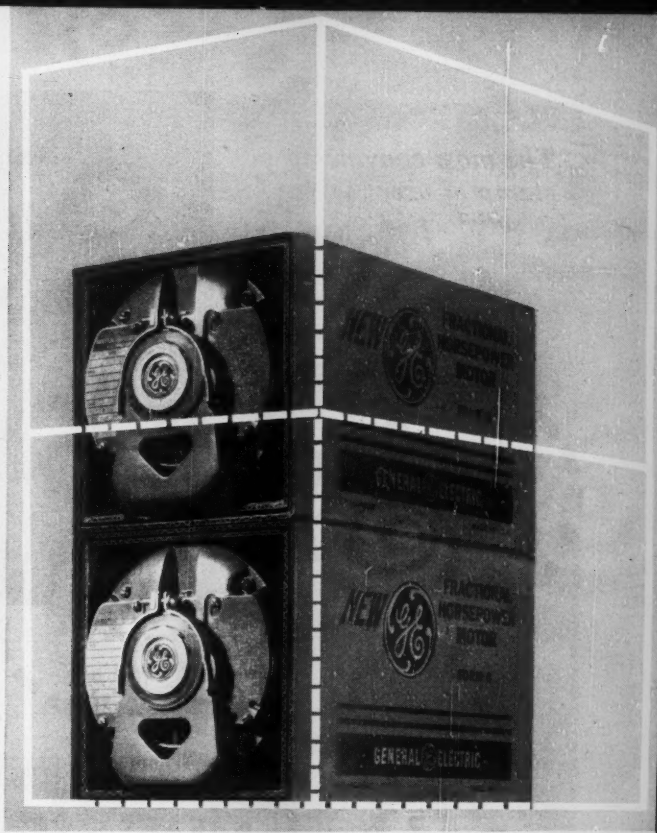
VENTILATING AIR CLEANING AIR TEMPERING INDUCED DRAFT EXHAUSTING FORCED DRAFT COOLING HEATING PRESSURE BLOWING



YOU SAVE ON ASSEMBLY COSTS—This actual, *life-size* photograph of G.E.'s ¼-hp motor shows you how compact the new line is. Its smaller size and lighter weight (up to *50%* lighter!) means easier handling, less assembly fatigue.



YOU SAVE MATERIAL AND TRANSPORTATION COSTS—Smaller motor size cuts down on mounting space and materials, means lower transportation costs. Lighter weight means less material and lighter mountings. All this brings savings to you!



YOU SAVE VALUABLE WAREHOUSE SPACE—The new G-E ¼-hp motor actually requires 25% less storage space. Other G-E ratings save you as much as 40% in space required for motor stocks, bring you reductions in your material-handling costs.

You save 3 ways by specifying General Electric fhp motors

This general-purpose fhp motor—smaller, lighter, more versatile than ever before—is the basic motor for an entire new line. Oil-burner motors, jet and sump-pump motors, lawn-mower motors, fan and blower motors and others. The savings you get from this basic motor carry through the entire line.

HERE'S HOW YOU SAVE

1—ASSEMBLY COSTS—your assembly line people will find the all-new G-E motor much easier to handle, far faster to install. And "assembly fatigue" . . . caused by handling heavy components . . . will be cut drastically.

2—MATERIAL AND TRANSPORTATION COSTS—structurally lighter mountings can be used. And up to 50% saving in motor weight can cut down your shipping costs.

3—WAREHOUSE STOCKING COSTS. Smaller motor size permits better use of your valuable warehouse space and modern material handling equipment.

WIDER RANGE OF USE

Vastly improved insulation and lubrication system add to the range of your product's applications. The unique all-angle bearing design permits moderate thrust loads in any direction.

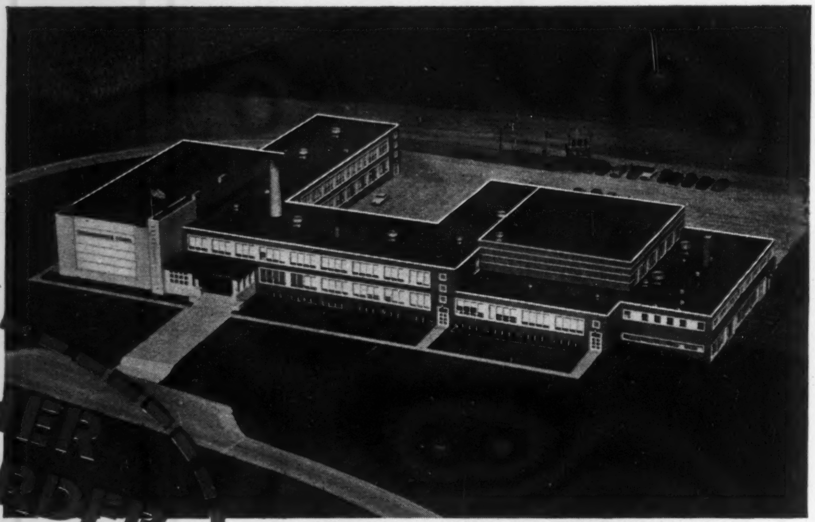
When you reorder fhp motors, ask your General Electric Sales Engineer to point out how these savings can benefit your business. Contact your nearby G-E Apparatus Sales Office, or write Section 702-9 for Bulletin GEA-5567. General Electric Company, Schenectady 5, New York.

Progress is our most important product

GENERAL ELECTRIC

The most convincing stamp of user satisfaction

ANOTHER REPEAT ORDER FOR SARCO



Susquehannock Junior-Senior High School Southern York County, Pa. *Architect:* Buchart Engineering Corp. *Engineers:* W. K. Hood & Associates. *Heating Contractors:* J. L. Thomas. *Plumbing Contractors:* C. C. Kottcamp & Son.

21 times in two years

Buchart Engineering Corporation Specifies Sarco Heating Specialties for School Projects

PLAIN TALK! Here's what the Buchart Engineering Corp., York, Pa., School Designers, has to say about the dependability of Sarco Heating Specialties:

> *"... all our school projects equipped with Sarco traps, temperature regulators, water blenders and heating specialties have had satisfactory, dependable service throughout the years."*

Sound reason why Sarco products were specified and installed in 21 schools designed by the firm during the last two years.

This record of confidence is convincing testimony to the dependability of Sarco Heating Specialties.

Why not specify Sarco on *your* next project and be assured of the same dependable performance.

Full information on all Sarco products is available on request. SARCO COMPANY, INC., Empire State Building, New York 1, N. Y. Representatives in principal cities.

SARCO

Sarco quality assures satisfaction

HERE ARE THE 21 BUCHART-DESIGNED PENNSYLVANIA SCHOOLS RELYING ON SARCO HEATING SPECIALTIES

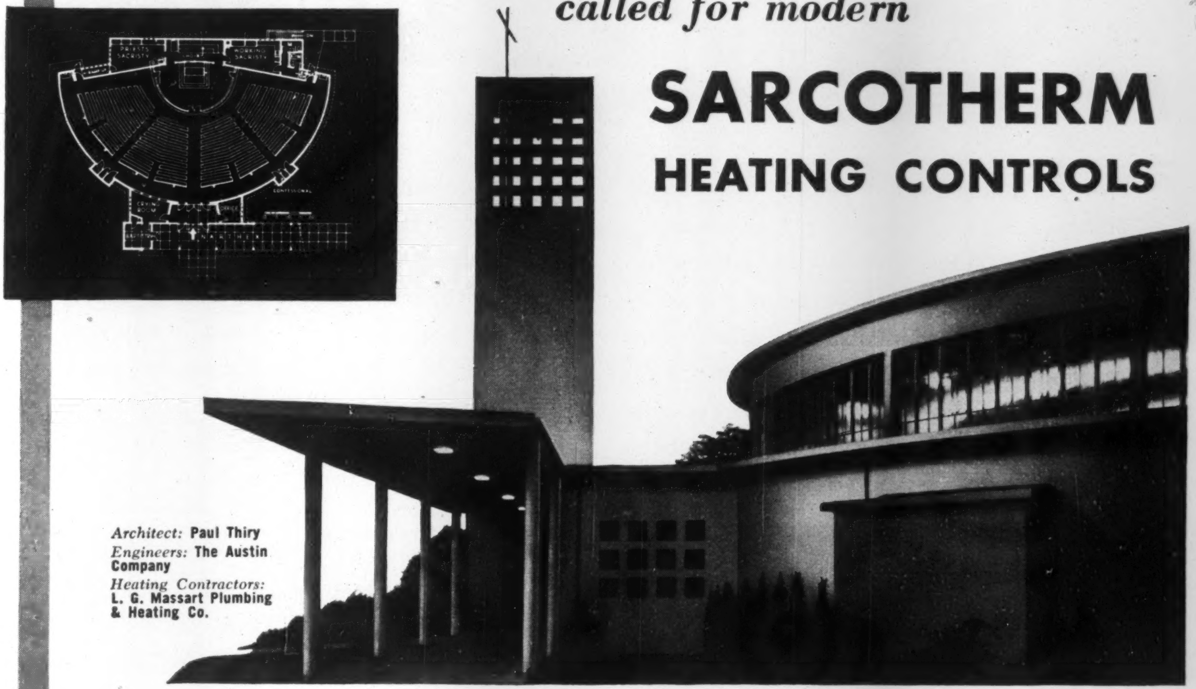
- Kennard-Dale Junior-Senior High School
- Susquehannock Junior-Senior High School
- York Township Elementary School
- Red Lion High School
- Spring Grove Elementary School
- Dover Joint Elementary School
- Southampton Township Elementary School
- Quarryville Boro Elementary School
- Springettsbury Township Elementary School
- Spring Grove Joint High School
- Jefferson Elementary School
- McConnellsburg-Ayr-Todd Elementary School
- Union-East Buffalo Elementary School
- Pequea Township Elementary School
- Mt. Rose Junior-Senior High School
- Kennard-Dale Junior-Senior High School Addition
- Stewartstown Elementary School Addition
- Windsor Township Elementary School
- Jackson Township Elementary School
- New Salem Elementary Center
- Springettsbury Independent Elementary School Addition

STEAM TRAPS • TEMPERATURE CONTROLLERS • HEATING SPECIALTIES

Radiator Valves • Traps
Strainers
Float-Thermostatic Traps
Camlift Bucket Steam Traps
Thermostatic Traps
Water Blenders
Air Eliminators
Dial Thermometers
Self-Operated Temp. Reg.

PAUL THIRY'S *daring, functional design called for modern*

SARCOTHERM HEATING CONTROLS



Architect: **Paul Thiry**
Engineers: **The Austin Company**
Heating Contractors:
L. G. Massart Plumbing & Heating Co.

CHURCH OF CHRIST THE KING, SEATTLE, WASH. Semi-circular arrangement seats 550 persons with no pew more than 50 feet from altar. Other features: 60-foot carillon tower; covered portico, stained glass clerestory.

ARCHITECT PAUL THIRY'S inspiring design for Church of Christ The King is completely functional from its 60-foot carillon tower down to its weather modulated controls.

Radiant heating and the large attendance expected necessitated an extremely accurate, sensitive control system. To do the job, design engineers specified a Sarcotherm Weather Compensated Control System which insures comfort conditions inside regardless of outside temperatures.

Sarcotherm advantages of simple, low-cost, accurate control plus unique engineering service can help you design and install the most efficient system possible. A Sarcotherm engineer will be happy to advise you on your next project.

For full information on Sarcotherm controls, write for complete catalog.

TAKE ADVANTAGE OF SARCOTHERM'S UNUSUAL ENGINEERING SERVICE

In A Class By Itself—Sarcotherm's engineering service begins with the inception of the job, *carries through* every step of the way.

Complete Installation Drawings And Wiring Diagrams—not just general drawings but complete, tailor-made drawings and diagrams for each individual job.

On The Job Help—your contractor gets full cooperation and technical assistance backed by many years of specialized experience.

SARCOTHERM CONTROLS, Inc.

Empire State Bldg., New York 1, N. Y.
An Affiliate of SARCO COMPANY, INC.

Weather Modulated Controls for **HOT WATER, RADIANT AND STEAM** *Heating Systems*

Powermaster®

New . . exclusive . . . .

Now . . . for the *first time* you can get packaged boiler units in the wide range of capacities from 15 to 500 HP, with *complete interchangeability of fuels* . . . light or heavy fuel oil—natural or manufactured gas—or combination gas and oil . . . and you get this cost-saving advantage *only* with *Powermaster* Packaged Automatic Boilers. Find out more about this new, wide-range service today from your *Powermaster* representative. He will help you with recommendations and suggestions for selecting the most economical units to supply steam or hot water requirements in any kind of service—industrial plants, institutions, public buildings, schools, laundries, apartment houses, hospitals, dairies, motels, and shopping centers.

Model 3 *Powermaster*—Experienced-proved to be the standard of industry. These three 350 HP units are supplying process steam at pressures up to 200 psi. with rapid response to load changes.

- Complete Fuel Flexibility:
  Light or Heavy Oil, Any Gas or Combination Oil and Gas.
- Choice of:
  Air Atomizing VORIFLOW Oil Burner—Pre-Mix VORIFLOW Gas Burner—Combination VORIFLOW Oil and Gas Burner—All Designed and Built by O & S.
- Full-Range Modulation with VORIFLOW Combustion.
- All Middle-Range and Large Capacities.
- Selection of Automatic Operating and Safety Controls.
- Instant Change from Fuel to Fuel.

Send for bulletins describing Model 3 and Model 4 *Powermaster* units.

Powermaster
Powermaster

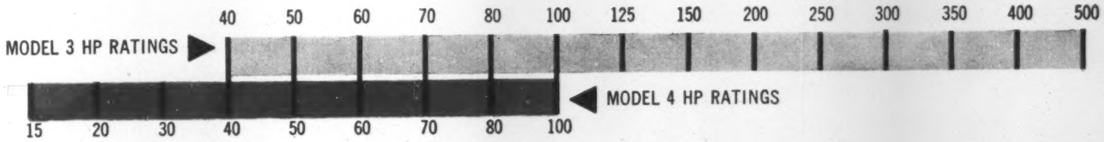
ORR & SEMBOWER, INC.
READING, PA.

BUILDING DEPENDABLE BOILERS SINCE 1885

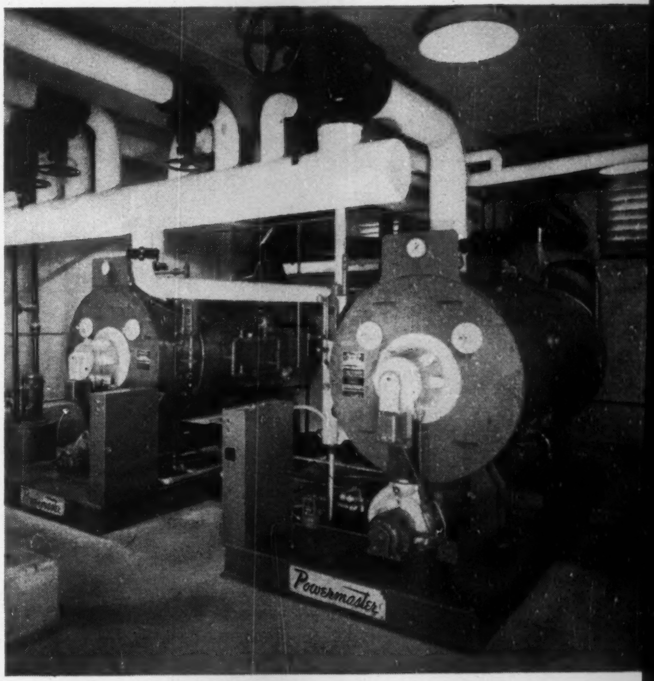
. . a choice of 2

Powermaster Packaged Automatic Boilers to meet your specific operating requirements . . . to your best advantage.

for 15 to 250 psi. steam or hot water



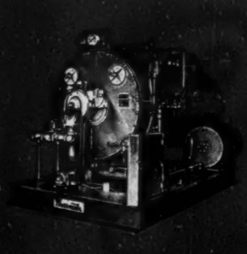
Model 4 *Powermaster*—Service-proved in wide variety of successful applications. These 40 HP units supply 15 psi. steam for heating. Simplicity of operation and controls is an important advantage.



- Choice of Fuels:
  Light Distillate—Natural Gas—Manufactured Gas—Combination Oil and Gas.
- Choice of:
  Mechanical Pressure Atomizing Oil Burner—Pre-Mix Gas Burner—Combination Oil and Gas Burner—All Designed and Built by O & S.
- Simple On-Off and Low-Fire Start Burners.
- Small and Popular Middle-Range Capacities.
- Selection of Automatic Operating and Safety Controls.
- Quick Change from Fuel to Fuel.

Powermaster®

PACKAGED AUTOMATIC BOILERS



ACCO
products

New 10,000 psi Rating for R-P&C Bar Stock Valve

New structural improvements in R-P&C's popular **Fig. 1040-A** carbon steel bar stock valve have resulted in substantially higher ratings for these rugged close control valves. New ratings range from 10,000 psi at 150°F to 475 psi at 1000°F. Sizes from ⅛″ to 1″. Each valve passes a hydrostatic test at 15,000 psi before leaving the factory.

R-P&C bar stock valves can supply an inexpensive, dependable answer to many of your valve application problems—particularly if these involve throttling or other close control service, high temperatures or high pressures. They are uniquely adapted for meter, gauge or instrument service or in crowded applications such as panel boards.

Fifteen different Fig. numbers in R-P&C's complete bar stock line provide close flow control for a wide variety of fluids. Pressure and temperature ratings, which vary for different materials and constructions, cover an extensive range. Among special applications covered are—

for Corrosion Resistance:

R-P&C Bar Stock valves are manufactured in 12-14% chromium stainless steel, and 18-8 molybdenum stainless steel for use with corrosive fluids—also particularly applicable for sub-zero service.

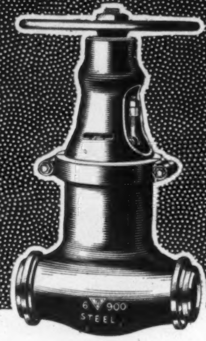
for Severe Throttling Service:

Fig. 1060-S Bar Stock valves have special discs of STELLITE—providing resistance to abrasion by cutting particles in extremely severe throttling service such as continuous blow-down with steam, water or other fluids.

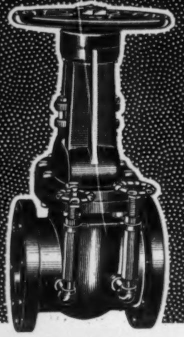
for Close Quarters, Unusual Piping Hook-ups:

The adaptability of R-P&C Bar Stock valves solves installation problems. These versatile valves are supplied in globe and angle styles with female ends, male and female ends, or male union ends. Also provided with welding or silver-soldering ends for welded piping systems. Special lock bonnets provide additional protection in applications involving constant vibration.

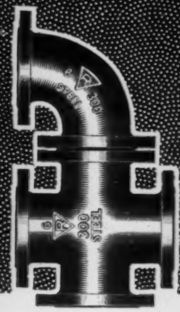
Write TODAY FOR CATALOG



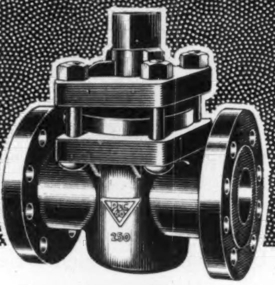
Pressure sealed bonnet joint cast steel valves are furnished in gate valve and globe valve styles in 900 lb., 1500 lb., and 2500 lb. pressure classes.



Lubrotite Gate Valves, exclusive with R-P&C, provide a patented lubricant seal which gives positive shut-off, retards corrosion, reduces maintenance. Furnished in iron, iron with bronze trim, cast steel with stainless trim, in sizes from 2″ to 24″.



Cast steel fittings, ells, tees, laterals, crosses, reducers—screwed or flanged ends. Furnished in a wide variety of sizes up to 24″, in pressure classes from 150 to 2500 lbs.



Asbestos-packed cocks, an R-P&C exclusive, are furnished in iron in sizes from ¼″ to 6″ with screwed or flanged ends.

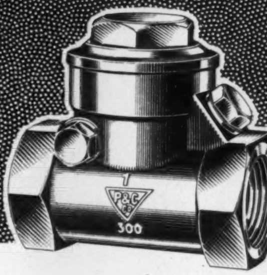
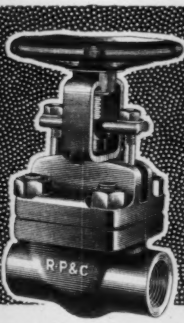


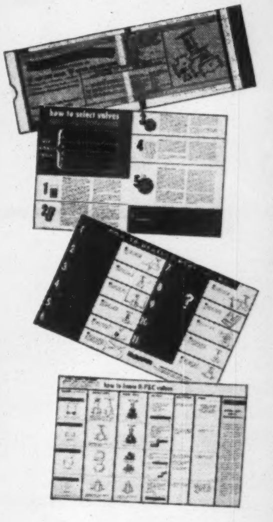
Fig. 212 screwed end bronze check valve typifies R-P&C's complete check valve line—furnished in iron, bronze or cast steel in sizes ranging from ¼″ to 24″.



Forged steel gate valves, like Fig. 6056 above, are offered in sizes from ¼″ to 2″ with flanged, screwed or welding ends. Pressure ratings range from 2000 psi at 100°F to 380 psi at 1000°F.

Which of these FREE TECHNICAL AIDS do you want?

R-P&C manufactures a *complete* line of valves—the units above only begin to indicate the comprehensiveness of the R-P&C line. In addition R-P&C supplies complete technical assistance—provides every possible aid to assist the buyer in valve selection, installation and operation. A few of these technical aids are shown at right.



VALVE SELECTOR SLIDE RULE

Handy selector slide rule gives all dimensions for iron body valves, steel valves in 150, 300, 400, 600, 900 and 1500 lb. classes.

HOW TO SELECT VALVES

17″ by 11″ wall chart lists principles to use in selecting valves for various applications . . . considers effects of fluids, temperatures, pressures, sizes and service requirements. Glossary of valve terms included.

HOW TO PROTECT YOUR VALVES

17″ by 11″ wall chart lists 22 installation and operation pointers to protect valves, get maximum life. Includes glossary of valve terms.

HOW TO KNOW VALVES

17″ by 11″ wall chart graphically shows appearance, construction, operation, recommended applications for gate, globe and check valves, cocks. Also National Safety Council operating recommendations.

Any of the above technical aids furnished promptly on request. Write R-P&C Valve Division, American Chain & Cable, Reading, Pennsylvania.

ACCO

TRADE MARK

R-P&C Valve Division
AMERICAN CHAIN & CABLE

Reading, Pa., Atlanta, Baltimore, Boston, Chicago, Denver, Detroit,
Houston, New York, Philadelphia, Pittsburgh, San Francisco,
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R-P&C
valves

USE COAL FOR LOW-

Schools • Hospitals • Institutions • Greenhouses

AND PROVIDE A FACTOR

WITH WILL-BURT

Will-Burt Stokers give relief from time-wasting grief at the installation stage and throughout the heating season

EFFICIENT COMBUSTION ASSURED UNDER EVER-CHANGING FUEL BED CONDITIONS

Will-Burt Patented Automatic Air Control delivers correct quantities of air for the most efficient combustion of bituminous coal under ever-changing fire bed conditions. The Automatic Air Control assures proper combustion of fuel during the operating period and also during the time the blower and stoker feed screw are off. Air induced by natural draft through the Automatic Air Control when the blower is idle is sufficient to prevent a condition of smoke and soot such as is usually prevalent when the fire is starved for air.

Will-Burt exclusive Automatic Air Control assures efficient combustion of bituminous coal during operating and off periods.

SMOKE AND SOOT PREVENTED

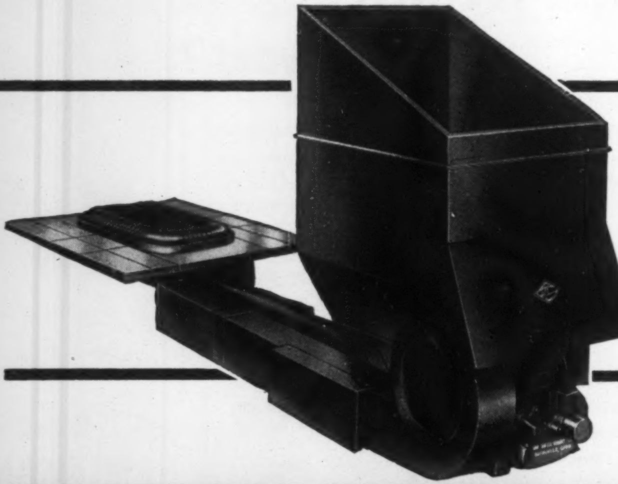
The Will-Burt Automatic Air Control allows enough of the normal draft to pass through and into the retort which in turn allows for the dissipation of any intense heat that may be surrounding the tuyeres or dead plate at the time the blower shuts off. This reduces boiler repair costs by maintaining more uniform boiler and furnace firebox temperatures. Air ports in the tuyere sections are designed to distribute air thoroughly throughout the fire bed and prevent clogging and sifting of fines into the windbox.

WILL-BURT
ORRVILLE, OHIO

WILL-BURT

HOPPER MODEL STOKER

Available in both open and closed models; capacities of closed models 20 to 125 lbs. per hour; capacities of open models 150 lbs. per hour and up to 750 lbs. Will-Burt Stokers provide uniform trouble-free heat for schools, hospitals, institutions, greenhouses, churches, apartments, stores and factory buildings.



The **WILL-BURT** *Company* **Over 20 Years in the**

COST HEATING IN

Country Clubs • Churches • Apartments • Factory Buildings

OF GREATER SAFETY

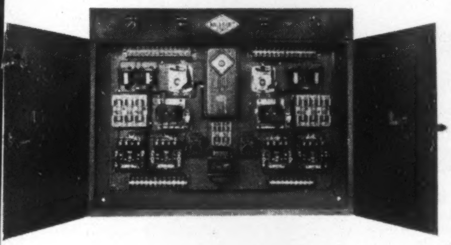
AIR CONTROLLED STOKERS

Your reputation is your priceless asset. Protect it by recommending coal heat where safety is paramount, and win the continuing respect of new customers by installing Will-Burt Air Controlled Stokers

---

A FACTOR OF GREATER SAFETY IN AUTOMATICALLY CONTROLLED HEATING IS ASSURED WITH **WILL-BURT** SAFETY DEVICES

Bituminous coal fired with a Will-Burt Stoker is positively the safest method of heating. Safety in heating is of utmost importance in schools, hospitals and institutions. Will-Burt controls provide limiting and operating controls which may be set to obtain maximum efficiency in use of fuel and coordinating operation of blower, Automatic Air Control and stoker under particular operating conditions. Will-Burt types of controls have been selected from a thorough understanding of what is required to obtain the utmost efficiency in both the stoker and blower operations. Will-Burt Engineers comprehend fully the function of controls in providing *a factor of greater safety for schools, hospitals and institutions.*

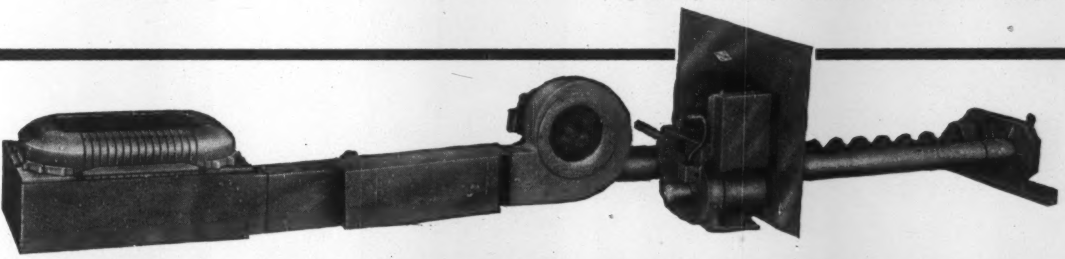


NEW WILL-BURT STOKER CONTROL PANEL COMPLETELY WIRED AND FACTORY-TESTED

Wired in accordance with national electric codes, panel controls include combinations of disconnect switches, selector switches, hold-fire controls, shear pin alarms, and time switch. Stokers are protected at all times by separate individual operating and limit controls, low water cut-offs, and shear pin switches. Available in a standard unit, ready to install and operate.

SAFETY SHEAR PIN AND DISCONNECT SWITCH

If an overload occurs, a protective pin shears. An automatic switch stops the motor and fan. Fire continues at a slow burning rate; the coal screw and burner are not subjected to damaging temperatures. The shear pin is fully exposed and is easily reset without tools. A bell or light signal may be easily installed to indicate a sheared pin.



WILL-BURT BIN FED STOKERS FOR BITUMINOUS COAL BURNING BOILERS AND FURNACES

Reduces cost of coal handling and maintenance to an all-time low. Widely used throughout the nation and in several foreign countries for heating schools, hospitals, institutions, etc.

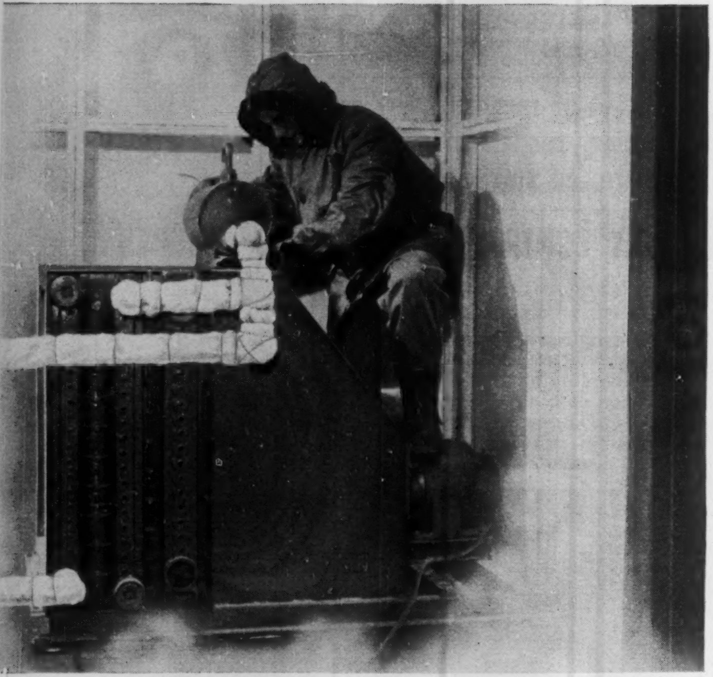
Write for Engineers Reference Manual which includes general stoker data and suggested specifications for Stokers, also installation diagrams for Will-Burt Hopper and Bin Fed Stokers and Will-Burt Control Panels.

BOX 902 • ORRVILLE, OHIO

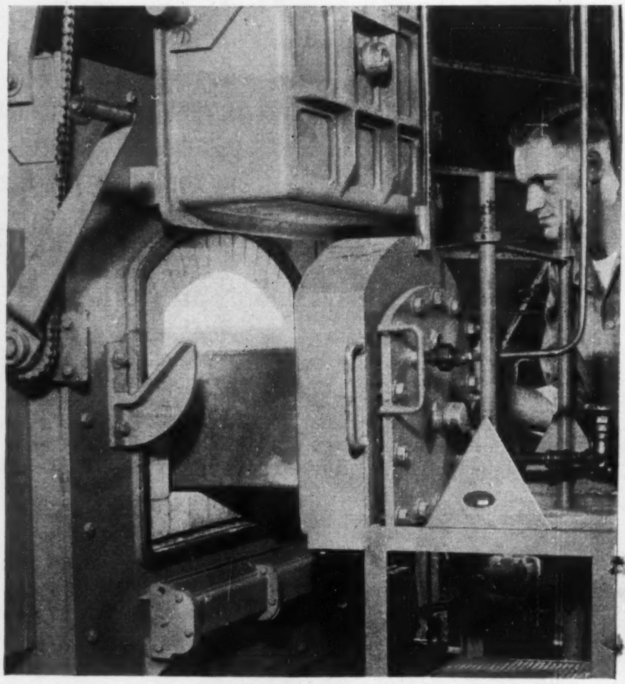
65° below to 2500° above today in

New Trane laboratory creates "terrible weather" . . . and

. . . for industry, homes

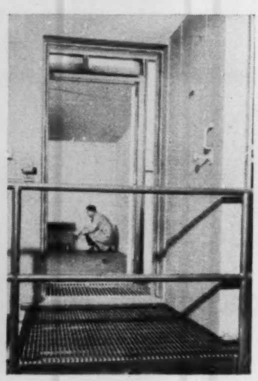


Cold as Siberia—or the stratosphere! This room, capable of creating 65-degrees-below-zero cold, is designed for testing the performance of TRANE equipment at low temperatures. Here, a radar tube cooler test set-up is being checked under conditions it might face in some bitterly cold Arctic plane-spotting station.

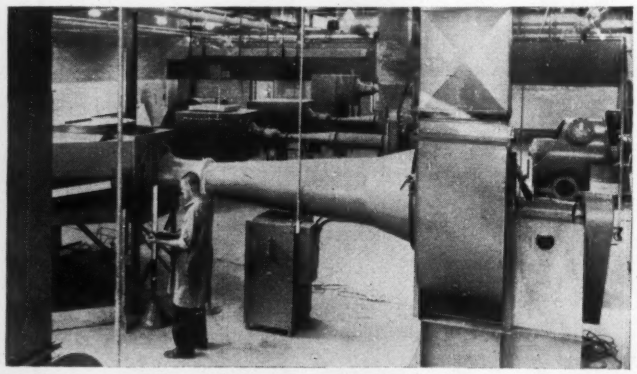


2,500 degrees above in this atmosphere-controlled furnace! Within this furnace may be developed new types of heat exchangers to work efficiently under the ever-climbing temperatures of new processes, much as TRANE Brazed Aluminum Surface was developed to provide a more compact, light-weight exchanger for special uses.

Chamber of silence, where a whisper is a "shout." In this soundproofed room, technicians check quiet operation of TRANE products. High standards of noise-free operations are vital.



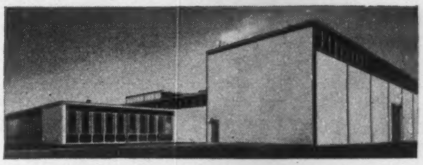
Room-within-a-room is for rating TRANE heating equipment. Refrigerated air is circulated within the double wall, simulating winter conditions. You get assurance of *full* rated capacity from *every* TRANE unit.



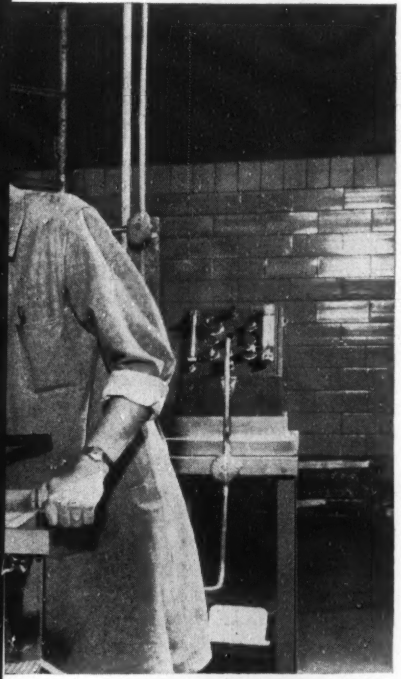
More than a dozen wind tunnels provide the wide range necessary to test all types of TRANE (and other) equipment. A continuous, long-term testing program provides the complete and authoritative performance data that has made TRANE sales engineers in 90 U. S. offices and throughout the world a dependable source of help and information . . . and helps make TRANE literature outstanding in the industry. Look to TRANE for the answers to your heating, cooling and ventilating problems.

La Crosse, Wis., and 60 m.p.h. gale!

new machines to overcome it
and the nation's defense!



New TRANE Research and Testing Laboratory



WITHERING HEAT of a mile-deep African gold mine . . . the numbing cold of an Arctic military post . . . or super-temperatures encountered in new industrial processes—you may find them duplicated, any day, in the new "House of Weather Magic" at La Crosse, Wis.

It's the new TRANE Research and Testing Laboratory, an investment in time, talent and the tools of research for developing better equipment—new methods of heating, air conditioning, ventilating, heat transfer.

TRANE leadership in these fields stems from such research—research which has produced such outstanding new products as the TRANE *CenTraVac* (hermetic, centrifugal water chiller) . . . *UniTrane* multi-room air conditioning units . . . the TRANE *Unit Ventilator* for schools . . . *Delta-Flo* Heating and Cooling Coils, and many others.

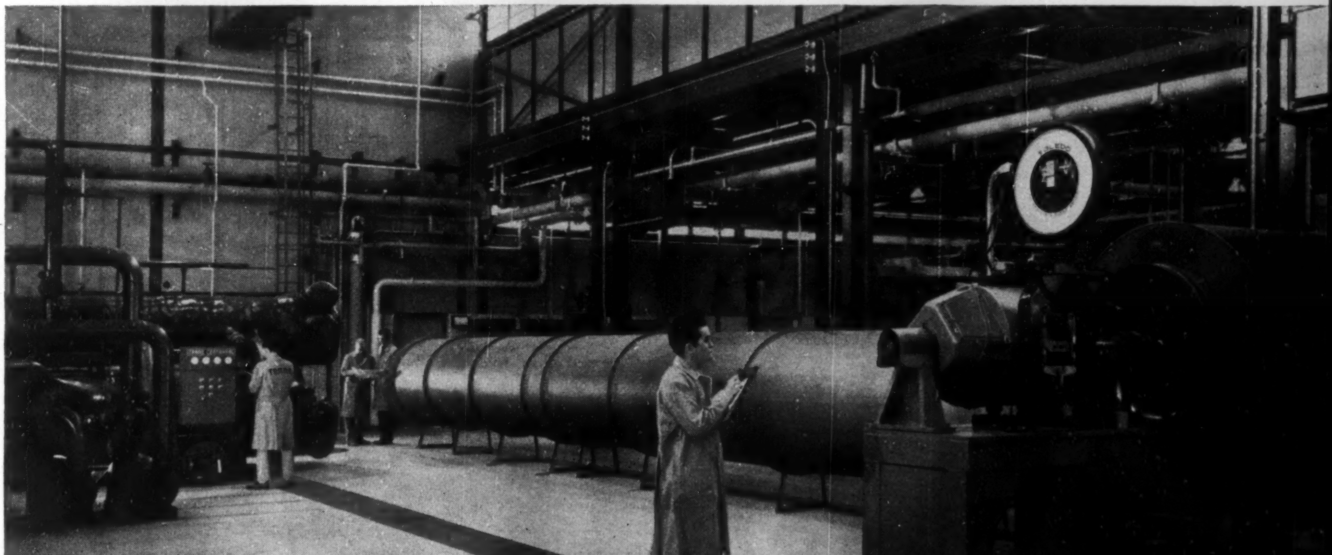
For complete information on the wide range of TRANE air conditioning and heating products, call your nearest TRANE Sales Office or write The Trane Company, La Crosse, Wis.

TRANE

manufacturing engineers of
AIR CONDITIONING, HEATING,
ventilating and heat transfer equipment

The Trane Company, La Crosse, Wis. • East. Mfg. Div., Scranton, Penn.
Trane Co. of Canada, Ltd., Toronto • 90 U.S. and 14 Canadian Offices

↓ **"Big Bertha"** is the nickname given this duct used for testing large centrifugal fans. Test set-ups like this provide accurate ratings for TRANE Fans, help engineers in their never-ending search for more efficient designs, lower horsepower requirements.



When plans demand wide range, year 'round

CENTRAL STATION AIR CONDITIONERS

Specify

McQuay

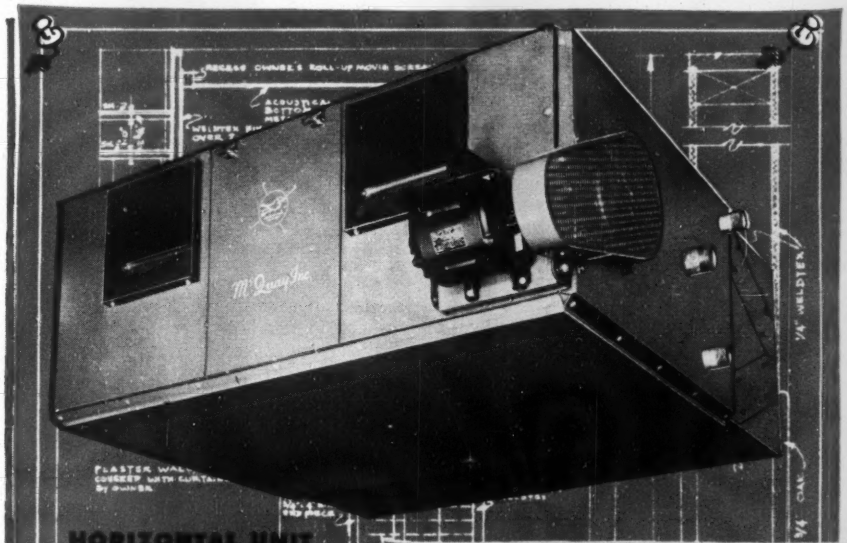
SEASONMASTERS

McQuay
SEASONMASTER

McQuay's 24-page catalog No. 505 will give you a big assist in planning the installation of central station air conditioners that will meet requirements of the job in every particular.

Seasonmasters come in 14 models, in both horizontal and vertical types and in a wide range of Cfm and Btu capacities. All models have maximum flexibility in location of coil connections and air openings. A full line of cooling and heating coils and a wide variety of accessories are available.

The many practical combinations are another McQuay engineering achievement that make it possible for you to install custom-made systems, and the McQuay Seasonmaster catalog No. 505 gives you complete information on how to do it. Get your copy now and be ready to make the right recommendations . . . recommend McQuay Seasonmasters with complete confidence of quality and dependability. Representatives in principal cities. Or write McQuay Inc., 1601 Broadway St. N. E., Minneapolis 13, Minn.

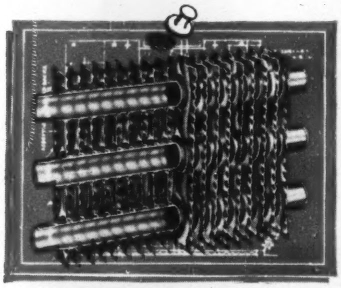


HORIZONTAL UNIT
with
• Water Coil • Steam Coil
• "V" Filter Section

McQuay
SEASONMASTERS

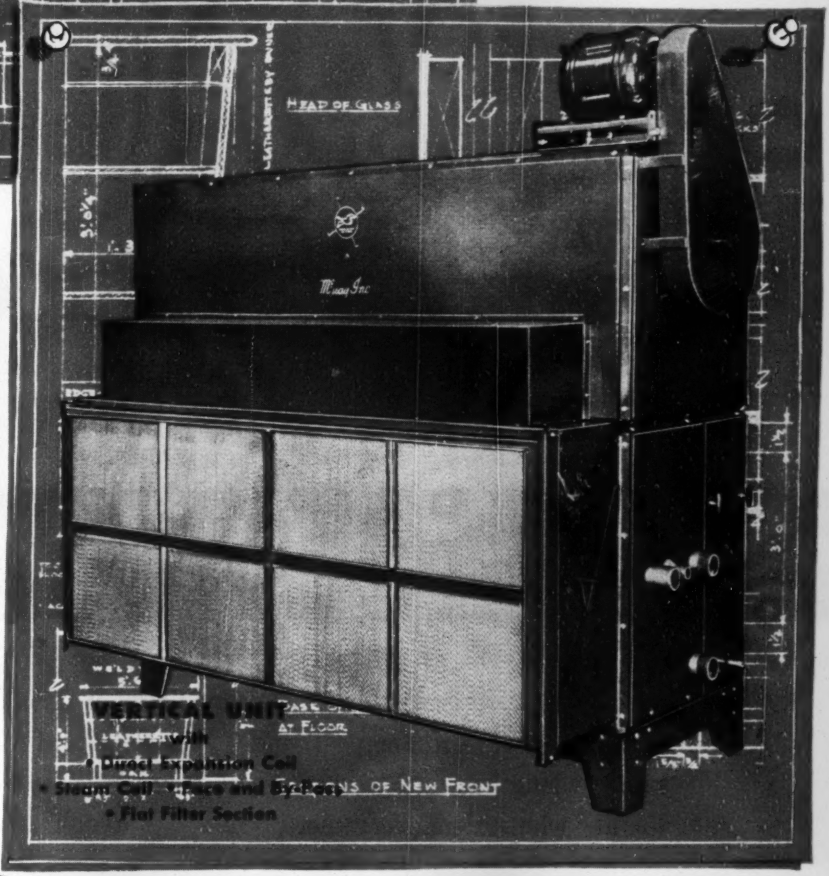
14 MODELS
IN THE LINE

Seasonmasters are adaptable to all year 'round demands...cooling and dehumidification, heating and humidification, positive ventilation, and air filtering. All models are available in both horizontal and vertical types.



FAMOUS RIPPLE-FIN
CONSTRUCTION

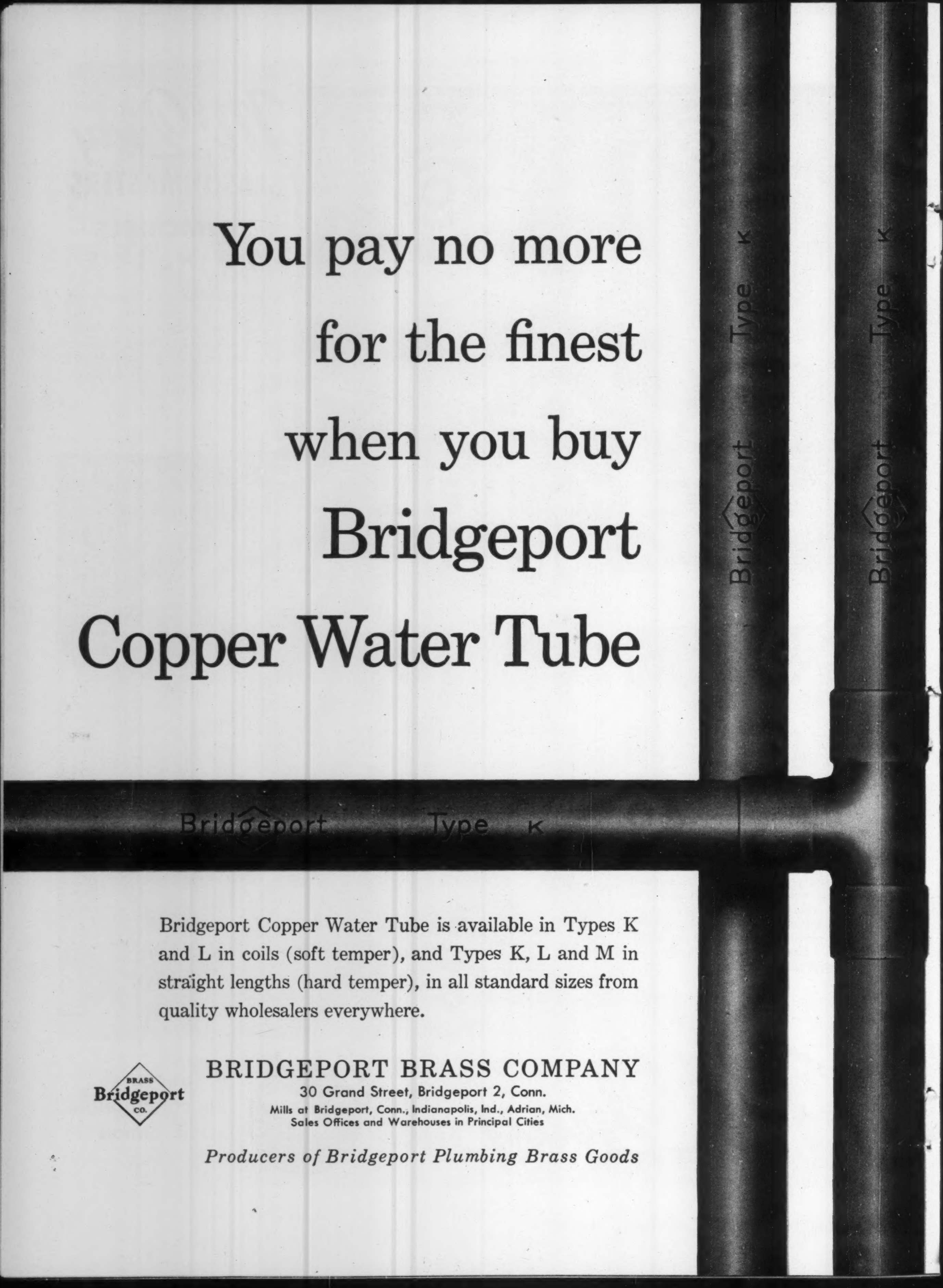
McQuay Ripple-Fin Coil construction is your assurance of unmatched heat transfer efficiency and economical long-life performance. Seamless copper tubes are expanded into wide, smooth collars of aluminum fins. Headers are heavy wall, seamless copper tubes.



VERTICAL UNIT
with
• Direct Expansion Coil
• Steam Coil • Face and By-Pass
• Flat Filter Section

McQuay INC.

HEATING
AIR CONDITIONING
REFRIGERATION



You pay no more for the finest when you buy Bridgeport Copper Water Tube

Bridgeport Copper Water Tube is available in Types K and L in coils (soft temper), and Types K, L and M in straight lengths (hard temper), in all standard sizes from quality wholesalers everywhere.

BRASS
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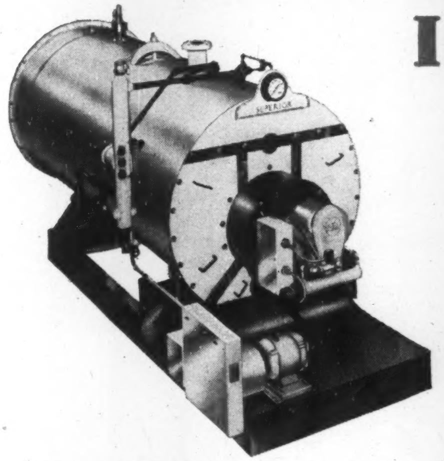
Producers of Bridgeport Plumbing Brass Goods

Completely "Packaged" Superior Steam Generators on factory test line.

only a TRUE PACKAGED boiler IS TESTED like this.



18 sizes from 20 to 600 b.h.p. for pressures to 250 p.s.i. or for hot water. For complete details write for Catalog 604.

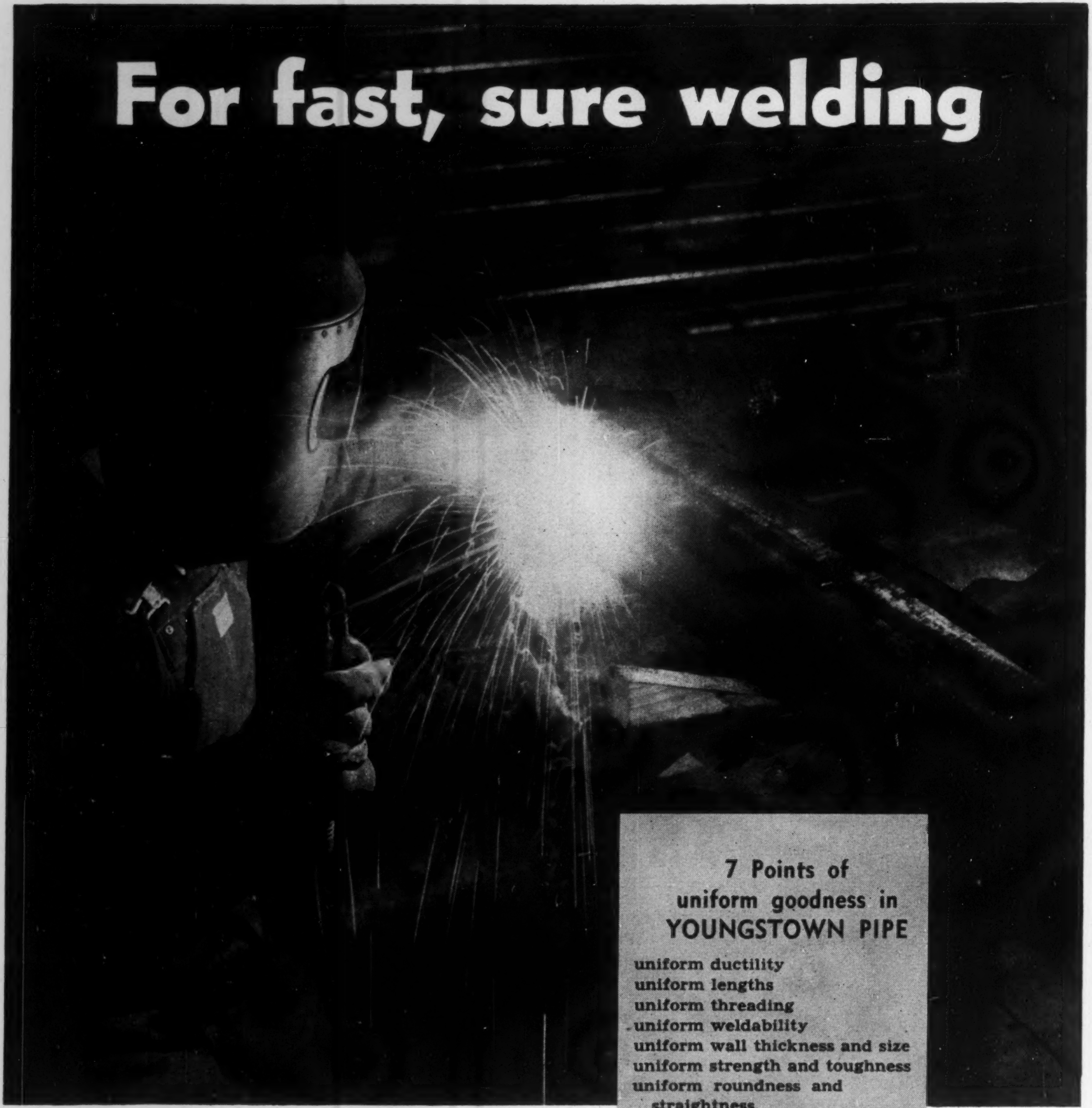
At the Superior factory in Emmaus, Pa., every steam generator is thoroughly tested before shipment. This is one of the outstanding advantages of the *true* packaged steam generator. Completely assembled at the factory with burner and all boiler trim installed, it is set on a testing line, connected to service supplies, and fired. During this test firing period, trained technicians thoroughly check on all points of performance and make whatever adjustments are necessary to bring the unit into top operating condition.

Then, and then only, is a Superior Steam Generator shipped . . . with a written guarantee based on the results of this actual test firing. There's no guesswork about Superior Steam Generators. Every guarantee is based on the actual performance of the unit to which it applies.

for performance you can **BANK** *on*

SUPERIOR
STEAM GENERATORS

SUPERIOR COMBUSTION INDUSTRIES INC.
TIMES TOWER, TIMES SQUARE, NEW YORK 36, N.Y.



For fast, sure welding

7 Points of uniform goodness in YOUNGSTOWN PIPE

- uniform ductility
- uniform lengths
- uniform threading
- uniform weldability
- uniform wall thickness and size
- uniform strength and toughness
- uniform roundness and straightness

● This man is position-welding an expansion joint in a steam line. Only good steel pipe like Youngstown takes this type of weld easily. That's because top-grade steel bonds better and faster. Depend on Youngstown and you're hours of labor ahead.

Youngstown

QUALITY YOUNGSTOWN SERVICE

THE YOUNGSTOWN SHEET AND TUBE COMPANY *Manufacturers of Carbon, Alloy and Yoloy Steel*

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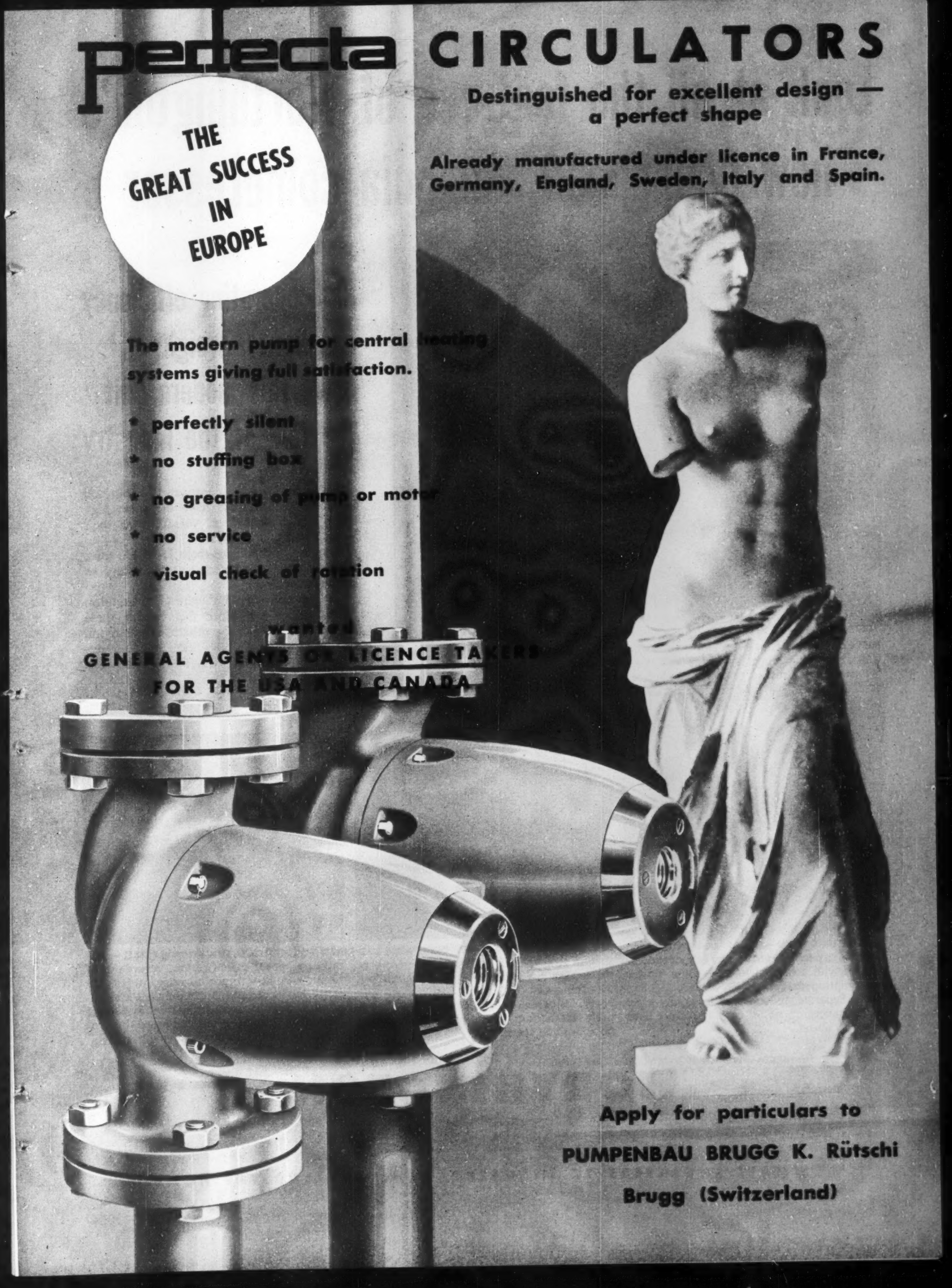

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Already manufactured under licence in France, Germany, England, Sweden, Italy and Spain.

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The modern pump for central heating systems giving full satisfaction.

- perfectly silent
- no stuffing box
- no greasing of pump or motor
- no service
- visual check of rotation

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GENERAL AGENTS OR LICENCE TAKERS
FOR THE USA AND CANADA

Apply for particulars to

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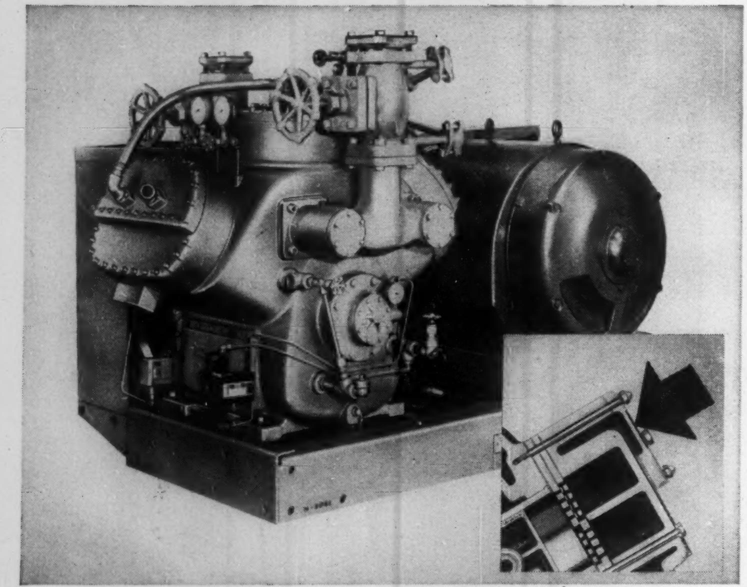
Brugg (Switzerland)

Look at all the features of Worthington's new high-speed ammonia compressor



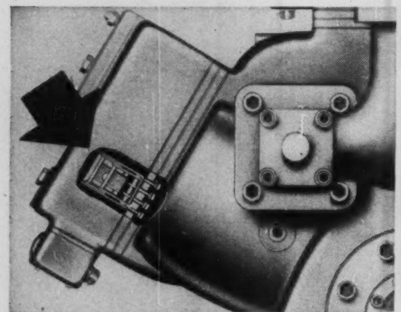
IMPROVED INTERNAL MANIFOLDING—cool suction gas completely surrounds the cylinder walls, providing longer valve life and increased overall efficiency. All passageways between suction discharge and shutoff valves are cast integrally within the crankcase, eliminating outboard fittings. Cross section shows water jacketing on one of the cylinders.

High operating efficiency and lighter weight make this modern unit the talk of the industry

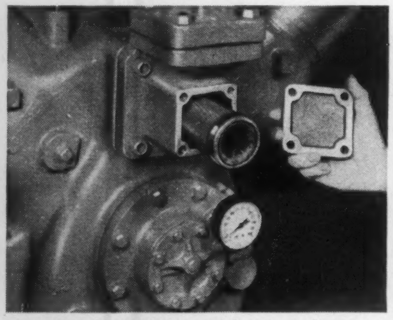
These lightweight, compact Worthington ammonia compressors have the same high operating efficiency and versatility as their lower speed counterparts.

Ranging in capacities from 18 to 150 tons, the new units can be used as high-stage or booster machines.

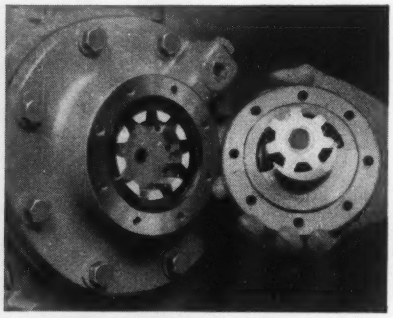
Get in touch with your nearest Worthington district office for more facts about these rugged compressors. Or write to Worthington Corporation, Air Conditioning and Refrigeration Division, Section A.3.56, Holyoke, Mass.



ELECTRIC UNLOADING—a new achievement in variable capacity control. You can start compressor with a normal torque motor; power consumption is automatically balanced against load. Separate unloader units allow easy maintenance . . . no oil or gas pressure lines to worry about.



NEW SUCTION MANIFOLD, with cover plate over suction strainer inlet, allows easy removal of the suction gas strainer for cleaning, without disturbing any of the pipes, valves or other parts. The strainer is unique in that it fits entirely within the crankcase manifold, requiring no additional space.

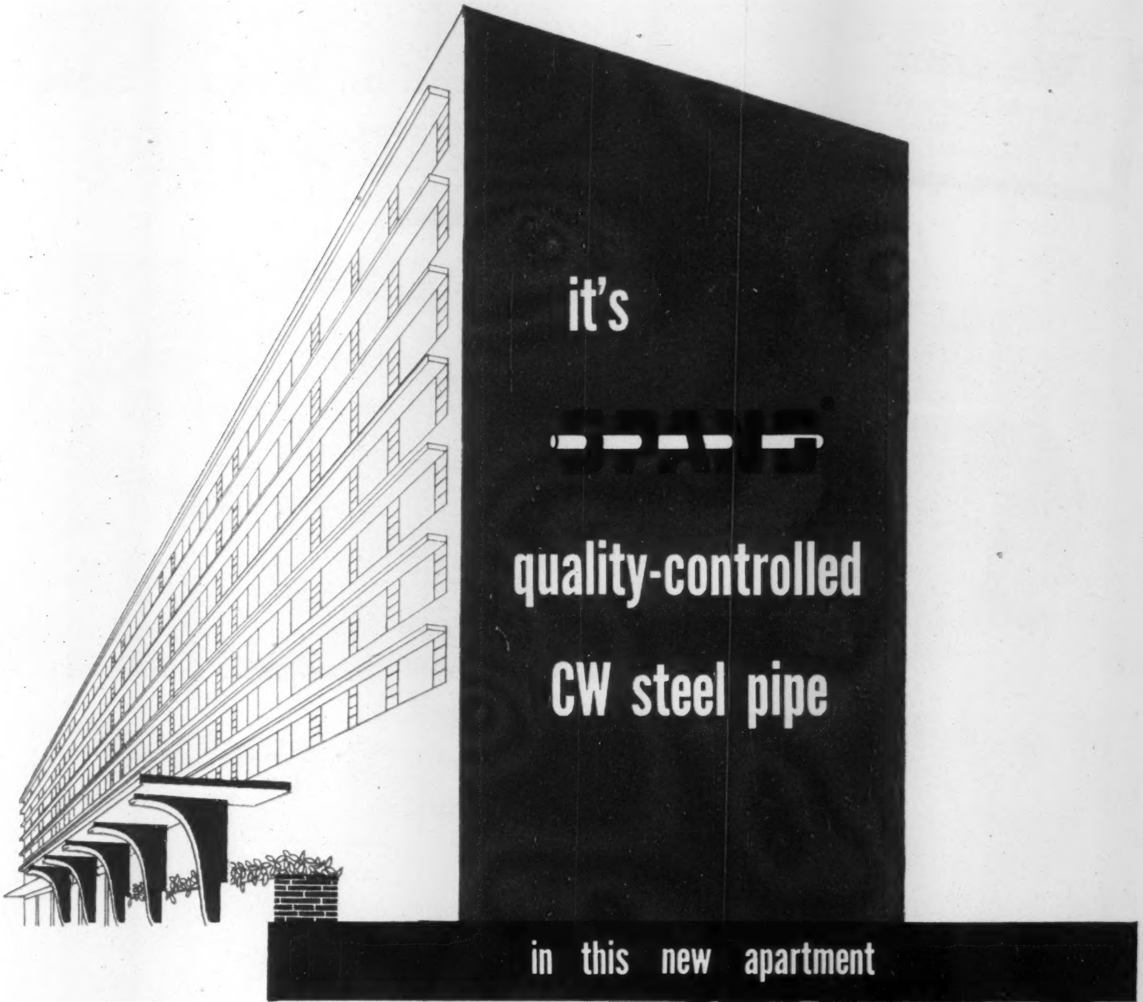


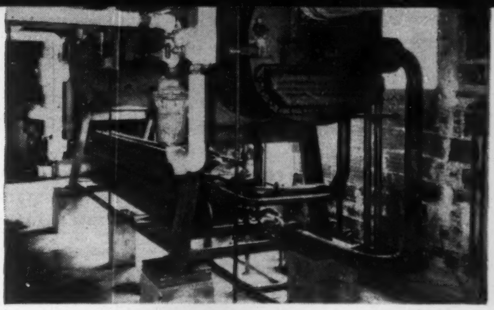
NEW FORCE-FEED LUBRICATION SYSTEM — full pressure, positive lubrication, regardless of rotation. A new rotary oil pump, driven directly by the crankshaft, eliminates complicated and noisy gear trains. Oil is filtered through a strainer in the crankcase for protection of pump and other moving parts.

A.3.56

WORTHINGTON

CLIMATE ENGINEERS TO INDUSTRY, BUSINESS AND THE HOME





Modern living and year-round comfort for tenants is the theme at the new Paces Ferry Tower Apartments in Atlanta, Georgia. This apartment hotel, one of the finest and most modern in the Atlanta area, contains 202 completely air-conditioned living units, in addition to convenient shops and a restaurant located on the first floor.

In every phase of design and construction, all materials were selected with extra care. That's why Spang CW Steel Pipe was used exclusively in the air conditioning system. And there's a good reason. The steel for manufacturing Spang CW Steel Pipe is carefully selected for special characteristics . . . strict metallurgical control is maintained during forming . . . and the finished pipe is thoroughly inspected to assure you of a perfect product.

This explains why Spang CW Steel Pipe is just right for easy forming, welding, cutting, bending, and threading . . . features that speed installation and reduce costs for you.

Don't take pipe that will "just do" . . . insist on Quality Controlled Spang CW Steel Pipe. Ask your distributor, he'll tell you why Spang is the best.

Owner: **Paces Ferry Tower, Inc., Atlanta, Georgia**
Architect: **J. C. Wise, Atlanta, Georgia**
General Contractor **Mion Construction Co., Atlanta, Georgia**
Piping Contractor: **Stephenson Company, Inc., Atlanta, Georgia**
Distributor: **Cowan Supply Co., Atlanta, Georgia**

SPANG

SPANG-CHALFANT

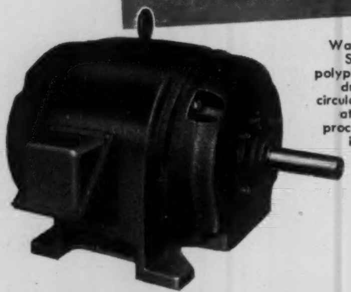
DIVISION OF THE NATIONAL SUPPLY COMPANY

General Sales Office: Two Gateway Center, Pittsburgh, Pennsylvania. District Sales Offices: Atlanta, Boston, Detroit, Houston, Los Angeles, New York, Philadelphia, Pittsburgh, St. Louis.

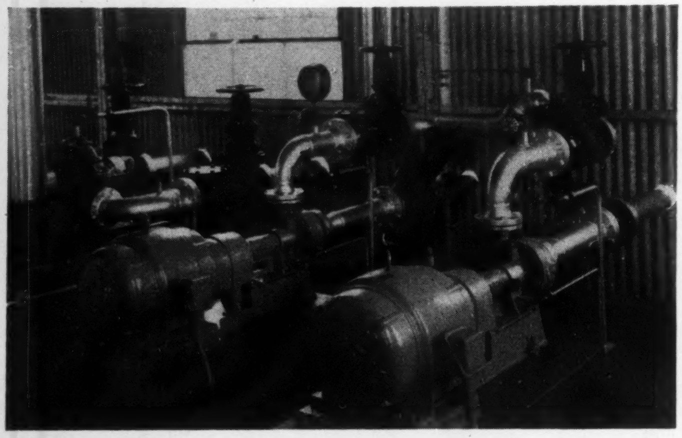
Wagner®
ELECTRIC MOTORS
...the choice of leaders
in industry

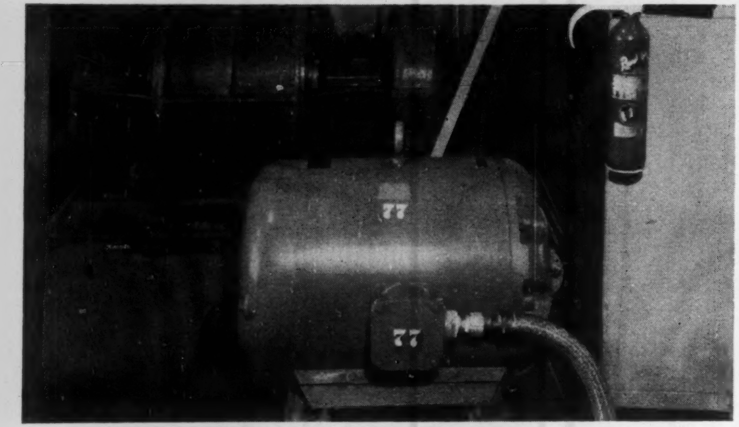
You can *depend* on Wagner Motors to furnish PLENTY OF POWER for your product

PUMPS

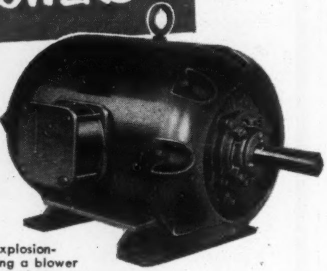


Wagner 15 hp Splash-proof polyphase motors driving water circulating pumps at a large oil processing plant in Louisiana.





BLOWERS



Wagner 40 hp Explosion-proof motor driving a blower to draw grain into a hopper at a Southern brewery.

Motors that drive compressors, pumps and blowers need plenty of electrical and mechanical stamina to hold up under the hard, steady grind demanded by these applications.

Fitting the right motor to such equipment is not a problem of designing and building special motors, but of choosing a standard Wagner Motor suited to the job. Wagner Motors are diversified in design and can be readily adapted to a wide range of compressor, pump and blower applications.

Improve the performance, economy, and dependability of your product by choosing Wagner Motors as standard equipment.

Bulletin MU-185 gives information on the complete line. Let a skilled Wagner engineer discuss your motor needs with you. Just call the nearest of our 32 branch offices, or write us.

MAY IS NATIONAL WATER SYSTEMS MONTH

Wagner Electric Corporation
EST. WEC 1891

WAGNER ELECTRIC CORPORATION
6370 PLYMOUTH AVE., ST. LOUIS 14, MO., U.S.A.

ELECTRIC MOTORS
TRANSFORMERS
INDUSTRIAL BRAKES
AUTOMOTIVE BRAKE SYSTEMS—AIR AND HYDRAULIC

BRANCHES AND DISTRIBUTORS IN ALL PRINCIPAL CITIES

M54-6.

SUPERB PERFORMANCE

on every heating and power assignment!

TITUSVILLE **TICOSTEAM**

PACKAGE STEAM GENERATOR

For factories, stores, hospitals, apartments, office buildings—wherever high-efficiency heating and power are a special consideration—specify and install TICOSTEAM for dependable satisfaction! A complete steam plant, equipped with every safety feature, this outstanding unit is *Titusville* in top quality and performance on the job. Request our descriptive Bulletin B-3100.

For light oil, and light oil and gas

•

Heavy oil, and heavy oil and gas

•

Natural or manufactured gas

TITUSVILLE
IRON WORKS CO
TITUSVILLE, PA.

A DIVISION OF Struthers Wells

THE TITUSVILLE IRON WORKS COMPANY

TITUSVILLE, PENNSYLVANIA

Manufacturers of A COMPLETE LINE OF BOILERS FOR EVERY HEATING AND POWER REQUIREMENT

TO CONSOLIDATE YOUR PURCHASES

USE Your Distributor

Put your TUBE TURNS' Distributor on your buying team and deal with one man instead of many . . . place one order rather than several. When it comes to welding fittings and flanges, your TUBE TURNS' Distributor can fill all your requirements. That's because TUBE TURNS offers industry's broadest line of welding fittings and flanges, covering over 4000 different items, in a complete range of types, sizes, and alloys.

Call your nearby TUBE TURNS' Distributor for prompt service that saves you time, simplifies your operations, cuts your costs.

PURCHASING

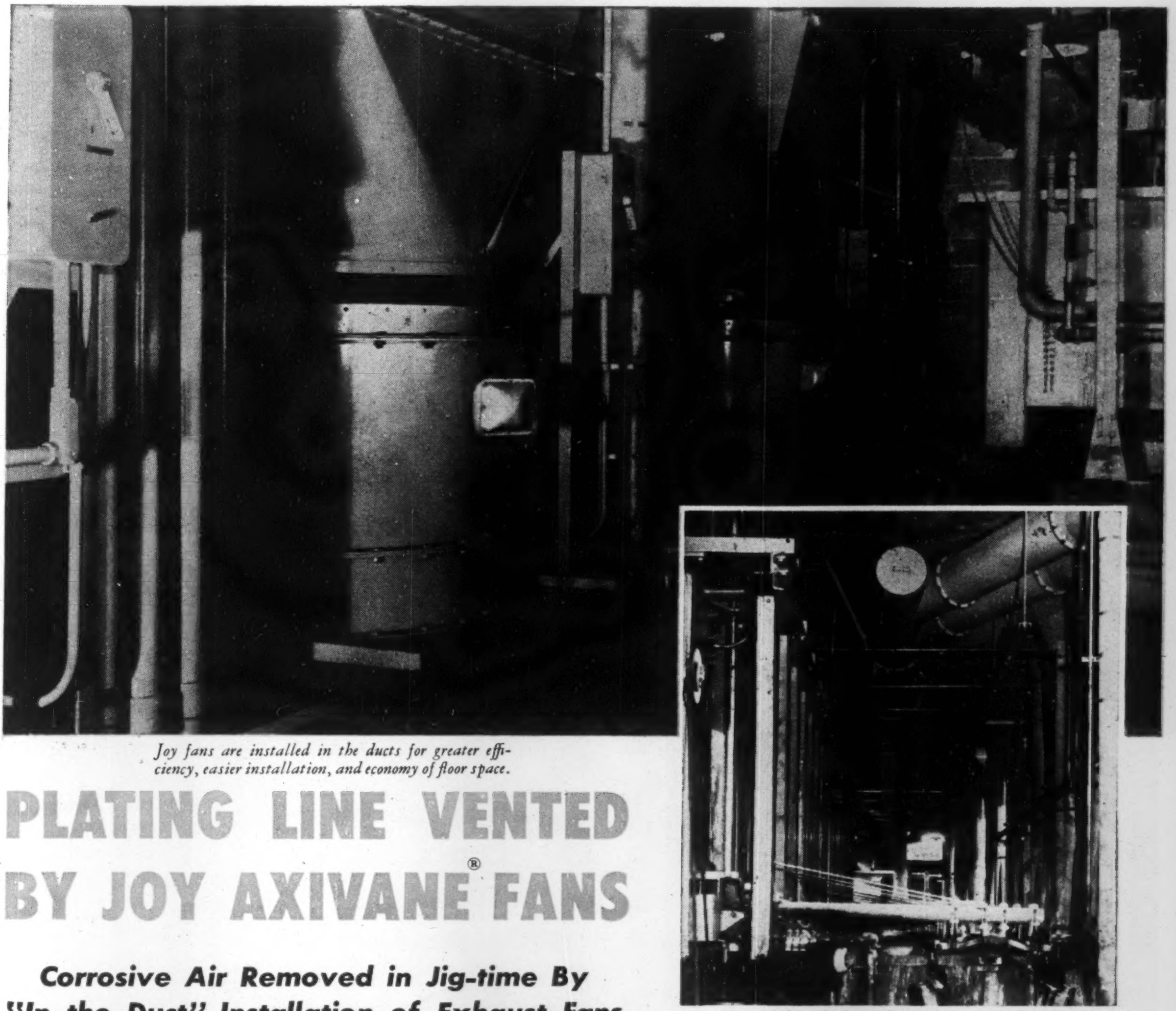
tt
TUBE-TURN

TUBE TURNS LOUISVILLE 1, KENTUCKY

A Division of National Cylinder Gas Company

DISTRICT OFFICES: New York • Philadelphia • Pittsburgh • Cleveland • Toledo • Chicago • Denver • Los Angeles
San Francisco • Seattle • Atlanta • Tulsa • Houston • Dallas • Midland, Texas

"tt" and "TUBE-TURN"
Reg. U.S.Pat. Off.



Joy fans are installed in the ducts for greater efficiency, easier installation, and economy of floor space.

Vertical branch ducts draw fumes into the trunk line for ultimate discharge into the atmosphere.

PLATING LINE VENTED BY JOY AXIVANE® FANS

Corrosive Air Removed in Jig-time By "In-the-Duct" Installation of Exhaust Fans

An interesting, and necessary, feature of the new zinc and cadmium plating line at Appleton Electric Company, Chicago, is the compactness of the Joy Axivane Fan exhaust system.

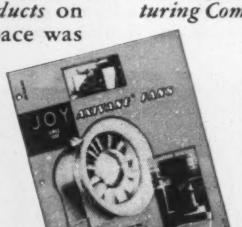
This exhaust system carries off the hot, corrosive air from the plating line up to the roof where it is discharged into the atmosphere.

Centrifugal units would have necessitated an expensive modification in the building structure, in addition to a larger, more complicated duct system.

The compact, in-line design of the Joy Axivane Fans permitted installation *right in the ducts* on the floor above the plating line. Floor space was saved, installation costs were drastically reduced, building structure did not have to be altered, and a much smaller and simpler duct system was constructed!

Joy Axivane Fans will show you new standards in efficiency, compactness, quietness, and outstanding versatility. There are 136 models . . . all with adjustable blades . . . for volumes up to 300,000 CFM and pressures to 11″ wg. Get the full story on Joy Fans by writing for Bulletin J-611, TODAY. **Joy Manufacturing Company, Oliver Building, Pittsburgh 22, Pa.** In Canada: *Joy Manufacturing Company (Canada) Limited, Galt, Ontario.*

Consult a Joy Engineer, or WRITE FOR THIS BOOKLET #J-611



W&D I 5039

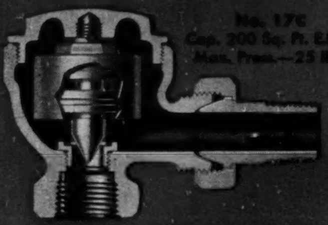
JOY

SPECIALISTS IN THE COMPRESSION AND MOVEMENT OF AIR AND GASES SINCE 1885

HOFFMAN STEAM TRAPS

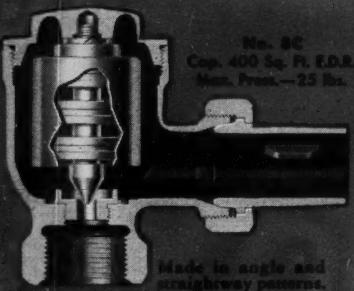
FOR LOW, MEDIUM and HIGH PRESSURES

LOW PRESSURE TRAPS



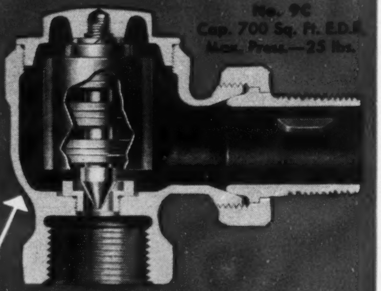
No. 17C
Cap. 200 Sq. Ft. E.D.R.
Max. Press.—25 lbs.

Made in angle, swivel and vertical patterns. ½" pipe conn. Thermostat and seat are renewable. Non-corrosive alloy.



No. 8C
Cap. 400 Sq. Ft. E.D.R.
Max. Press.—25 lbs.

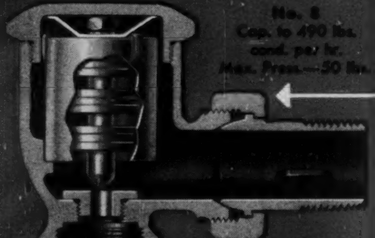
Made in angle and straightway patterns. ¾" pipe conn. Thermostat and seat are renewable. Non-corrosive alloy.



No. 9C
Cap. 700 Sq. Ft. E.D.R.
Max. Press.—25 lbs.

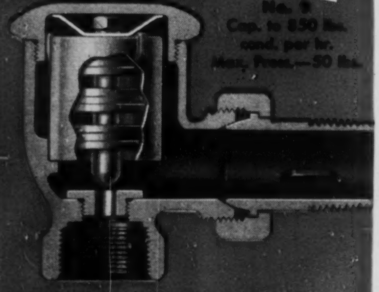
Made in angle pattern only. 1" pipe conn. Thermostat and seat are renewable. Non-corrosive alloy.

MEDIUM PRESSURE TRAPS



No. 8
Cap. to 490 lbs.
cond. per hr.
Max. Press.—50 lbs.

Made in angle, R.H., L.H., and straightway patterns. ½" x ½" and ⅜" x ⅜" sizes. Thermostat and seat are renewable. Non-corrosive alloy.



No. 9
Cap. to 850 lbs.
cond. per hr.
Max. Press.—50 lbs.

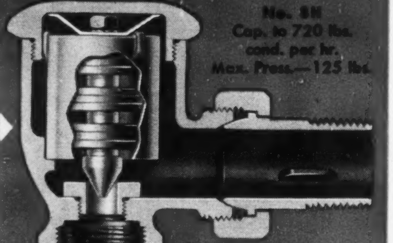
Made in angle pattern only. ¾" x ¾" and 1" x 1" sizes. Thermostat and seat are renewable. Non-corrosive alloy.

Thermostat diaphragms are of a special alloy which will not soften or crack from repeated flexings.

Removable thermal units are a distinguishing feature of Hoffman Traps, greatly simplifying clean-out and inspection work.

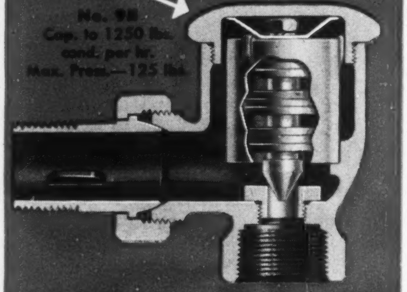
Hoffman offers a complete line of Low, Medium and High Pressure Thermostatic Traps with uniform guarantee of quality and precision workmanship. A full range of sizes and capacities assures you the correct trap for service with radiation, dryers, sterilizers, mangles, cookers and similar uses. Body, cap, nut and tail piece are of high quality brass. Other features of design contribute to long life, low maintenance cost Hoffman service.

HIGH PRESSURE TRAPS



No. 8H
Cap. to 720 lbs.
cond. per hr.
Max. Press.—125 lbs.

Made in angle, R.H., L.H., and straightway patterns. ½" x ½" and ⅜" x ⅜" sizes. Thermostat and seat are renewable. Non-corrosive alloy.



No. 9H
Cap. to 1250 lbs.
cond. per hr.
Max. Press.—125 lbs.

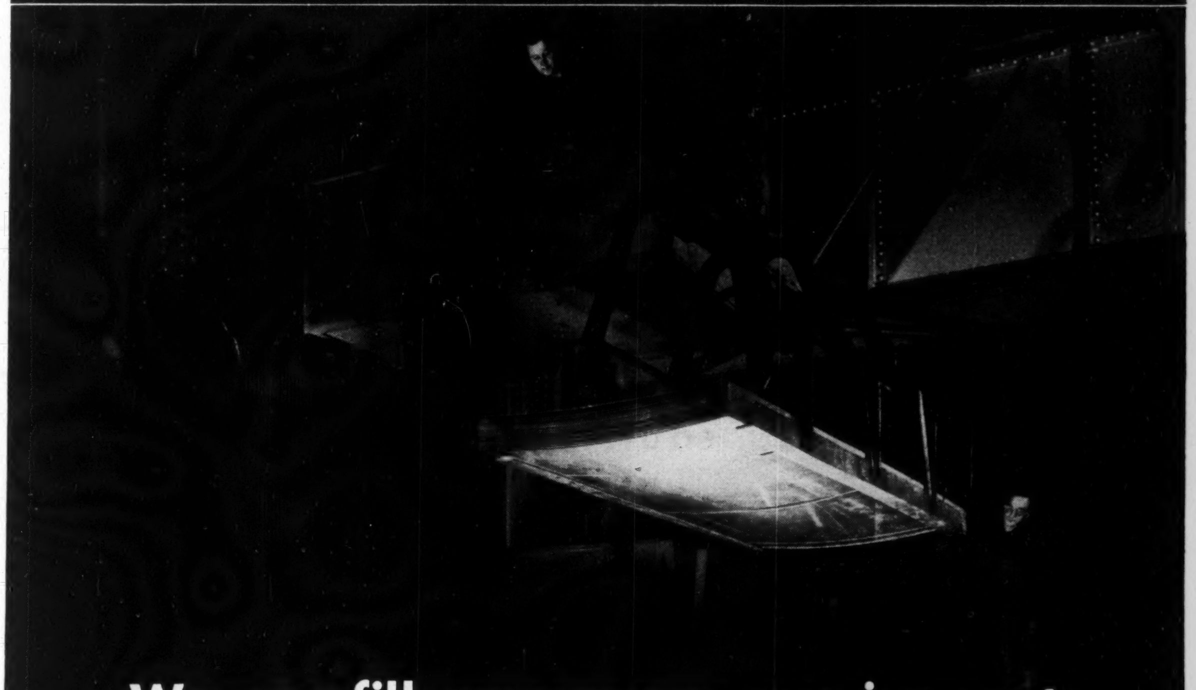
Made in angle pattern only. ¾" x ¾" and 1" x 1" sizes. Thermostat and seat are renewable. Non-corrosive alloy.

HOFFMAN STEAM SPECIALTIES

HOFFMAN SPECIALTY MFG. CORP.
VALVES, TRAPS, VACUUM AND CONDENSATION PUMPS, FORCED HOT WATER HEATING SYSTEMS

1001 York St., Indianapolis 7, Ind.
Sold by Leading Wholesalers of Heating and Plumbing Equipment

WHY IT PAYS TO BUY SHEETS and STRIP FROM US



We can fill emergency requirements with the exact quality you need

YOU needn't worry when you find you're running out of steel sheet or strip and are unable to complete a production run. You can depend on U. S. Steel Supply to rush the needed steel to your plant or shop immediately. And because of the complete stocks in all our warehouses, you can be sure you'll get steel of exactly the same quality and specification you were using. So you don't have to lose costly production time when you need extra steel.

All the sheet and strip we sell bear the famous USS trade-mark—your guide to quality steel. Call us for: hot rolled, cold rolled, vitrenamel, galvanized, galvannealed, paint bond, corrugated, long terne sheets, and hot rolled and cold rolled strip steel.

TRIPLE SECURITY

What you want
When you want it
At the **right price**

U. S. STEEL SUPPLY
DIVISION

General Office
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Coast to Coast

UNITED STATES STEEL

1854 · 1954

our 100TH year

OF SUCCESSFUL MANUFACTURING EXPERIENCE

YOU'LL SELL MORE PROFITABLE JOBS

with the complete line of

Curtis

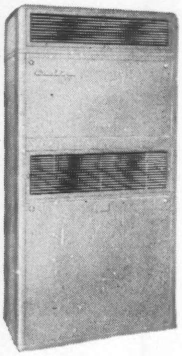
AIR CONDITIONING AND REFRIGERATION EQUIPMENT

Every product in the Curtis line is built with quality material and workmanship.

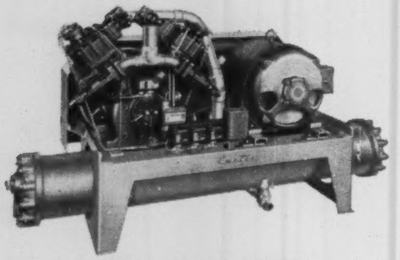
Curtis equipment is known around the world for its dependability and efficiency.

With the complete Curtis line, you can handle any installation for **Home, Office, Store,** or **Factory.**

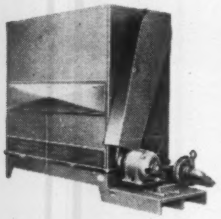
NEW 1954 Curtis Room Air Conditioner — an attractive, efficient unit with a BIG market potential



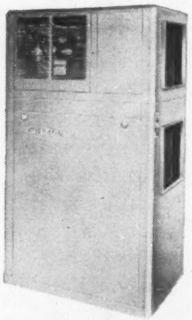
Packaged Units— 2, 3, 5, 7½ and 10 tons Choice of open or semi-hermetic compressors . . . and 15 ton packaged Central type units



Condensing units—through 80 tons



Evaporative Condensers, Cooling Towers and Air Handling units to match



Residential cooling and heating units

You may qualify for a direct factory franchise. Write us, using your company letterhead.

POST
TIME
Newsweek
house home

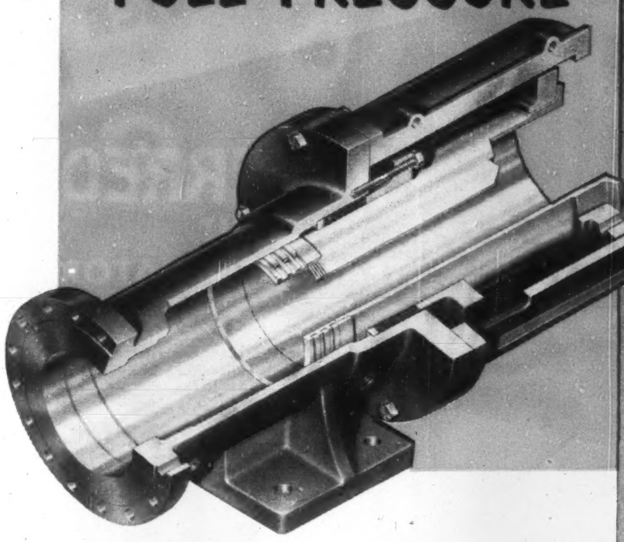
National advertising in *Saturday Evening Post, Time, Newsweek* and *House and Home,* plus many other publications helps sell Curtis to your customers and prospects. Attractive new sales literature is available to help you sell in your local area.

765

CURTIS REFRIGERATING MACHINE DIVISION
OF CURTIS MANUFACTURING CO.
1950 KIENLEN AVENUE
ST. LOUIS 20, MISSOURI

ADSCO EXPANSION JOINTS...

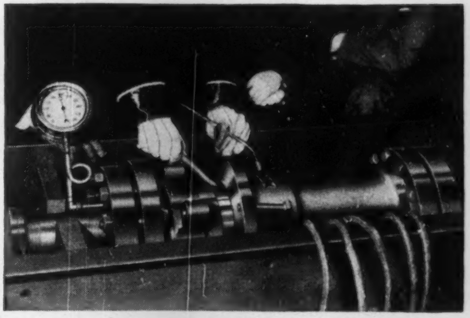
UNPACKED AT FULL PRESSURE



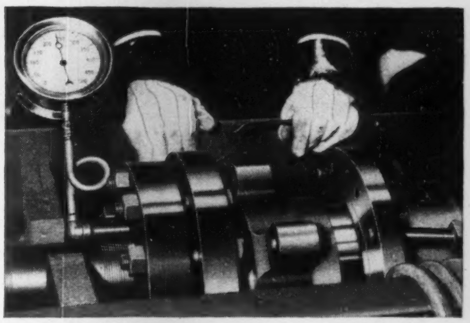
▶ ADSCO piston-ring expansion joints can be serviced . . . in fact, unpacked and repacked . . . under full line pressure. There is no interruption of service, no down-time for repacking, because the job is done under normal working conditions.

▶ Yet this isn't the only great feature of this high-quality joint. Slip is completely guided . . . split external guide permits smaller manholes . . . limit stops prevent over-travel of slip . . . polished surface cannot be scored because slip is in contact with packing only . . . misalignment is prevented by both internal and external guiding. ADSCO piston-ring expansion joints are available in a full range of sizes, with 4", 8", or 12" traverse per slip, for pressures to 400 psi and greater and for temperatures to 800F and higher. Call an ADSCO representative or write for Bulletin 35-15H.

. . . and here's proof



Last strand of packing being withdrawn from stuffing box.



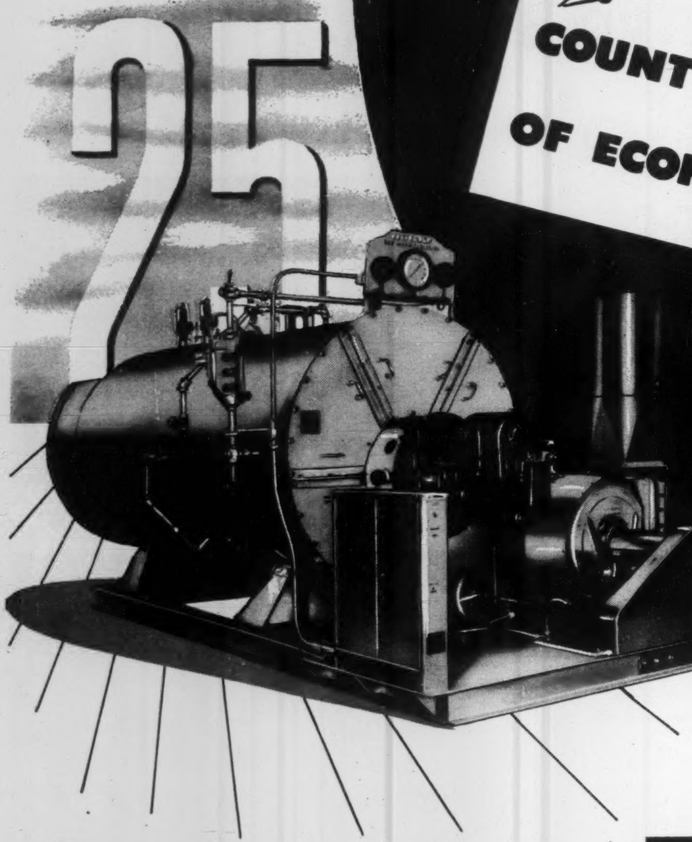
Close-up photograph shows all packing removed. With steam at 240 lbs. pressure and with 300° superheat there is no trace of steam in the empty stuffing box.

With periodic adjustments of the gland, it may never be necessary to repack the stuffing box in an ADSCO piston-ring expansion joint. However, lack of maintenance may make it necessary at some time to do so and the job is easy with this ADSCO joint. The piston rings hold the line pressure during the unpacking and repacking operation. With the vent valve open, the vent chamber is at atmospheric pressure and, under this condition, no steam can enter the stuffing box space. Thus complete repacking can be done under full line pressure.

ADSCO
ENGINEERED
PRODUCTS

EXPANSION JOINTS
HEAT EXCHANGERS
STEAM TRAPS
STRAINERS
SEPARATORS
METERS

AMERICAN DISTRICT STEAM COMPANY, INC.
GENERAL OFFICES
NORTH TONAWANDA, NEW YORK
PLANTS: NORTH TONAWANDA, N. Y., AND RICHMOND, CALIF.



COUNT ON 25 YEARS OF ECONOMICAL SERVICE

from a

PREFERRED UNIT STEAM GENERATOR

Preferred Unit Steam Generators are available in sizes from 20 to 600 B.H.P. and pressures from 15 to 250 psi, to burn oil, gas or in combination

All units are factory fire-tested before shipment.

Because of the economies it realizes in low overall operating and maintenance costs, a Preferred installation pays for itself in *five years or less,* amortization included. Yet it gives 25 years expectancy of sustained high thermal efficiency (80% or more) over the entire range of load demand. Thus, four-fifths of the life of the installation costs you nothing!

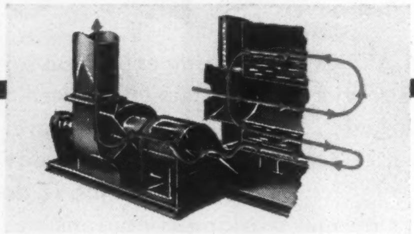
10 DESIGN FEATURES ARE THE REASON

Incorporated in the Preferred Unit Steam Generator are ten design features which make possible the remarkable record of this "packaged" boiler. Other makes may have some of these features, but only the Preferred has ALL TEN. They are combined to assure lowest cost steam generation by cutting fuel consumption by 10% or more and, above all, by cutting to a minimum such maintenance costs as refractory repairs, tube cleaning and corrosion-caused replacements. Although hundreds of Preferred Generators are in daily operation, there has never been a single case of furnace loss. There has never been a single loss of a pressure vessel.

The inter-related functions of Preferred's ten design features are discussed in Bulletin 2000. You'll find it interesting and profitable to study. Write for a copy.

PREFERRED UTILITIES MFG. CORP.

1860 BROADWAY, NEW YORK 23, N. Y.
DEPARTMENT SH-3



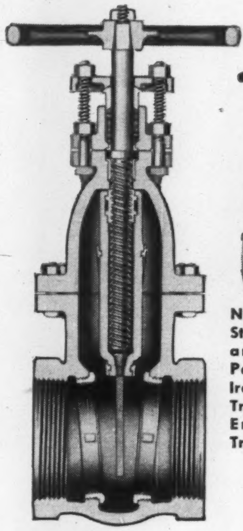
EXPANSILE PRECIPITATOR

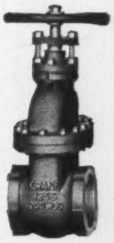
Holds and contains entrained non-combustibles and insures clean, smokeless operation. It makes possible the maintenance of maximum gas velocities in all tubes at all times by preventing the build up of deposits, particularly at the last pass.

The Expansile Precipitator is one of the 10 design features which insure long service life and low overall maintenance and operating costs. Here are the other nine . . .

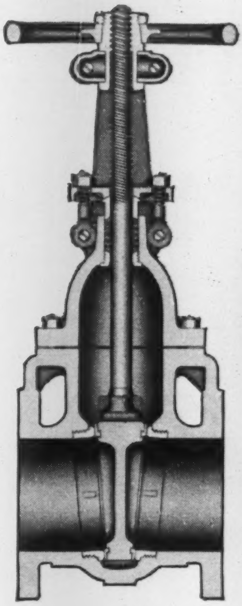
- Five Sq. Ft. of Heating Surface per Boiler HP
- Four Pass Gas Travel
- Down Draft Design
- Induced Draft
- Intermediate Furnace Position
- Anti-Stress Deck
- Staggered Tubes
- Dual Purging Action
- Full Automatic Oil and/or Gas Burners

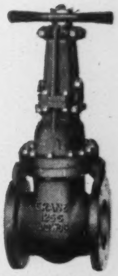
Crane 125-Pound Iron Body Wedge Gate Valves are an improved design, embodying many features of unusual merit. They set a new peak for quality in iron body wedge gate valves, having greater strength, longer life, and better all-round adaptability for all types of services.





Non-Rising Stem; Screwed and Flanged Patterns; All-Iron or Brass Trimmed. Hub Ends, Brass Trimmed only.





Outside Screw and Yoke; Screwed and Flanged Patterns; All-Iron or Brass Trimmed. Also available with brass seats and steel stem.

See If You Don't Agree!

Here's the big value—the big selection: CRANE 125-Pound Iron Body Wedge Gates

. . . with quality features that assure exactly the kind of service you want. Body and bonnet are oval-shaped with extra metal where it's needed most, to provide liberal strength. Flanged patterns have tie-ribs between body and bonnet flanges. You also get a solid web-type disc with long guides . . . a stem of liberal diameter with long thread engagement . . . an exceptionally deep stuffing box with high-grade packing . . . a two-piece ball-type gland and flange—plus an easy-to-grip handwheel with oval-shaped rim. Non-rising stem valves have a brass bushed stem collar. OS&Y design includes a brass bonnet bushing, swinging eye bolts . . . and a tee-head disc-stem connection on sizes 12-inch and smaller.

Big selection includes all-iron or brass trimmed valves . . . Underwriters' pattern valves, quick-opening types . . . valves for process industries . . . valves for marine service. Sizes up to 48-inch. Check your Crane Catalog or ask your Crane Representative next time he calls.

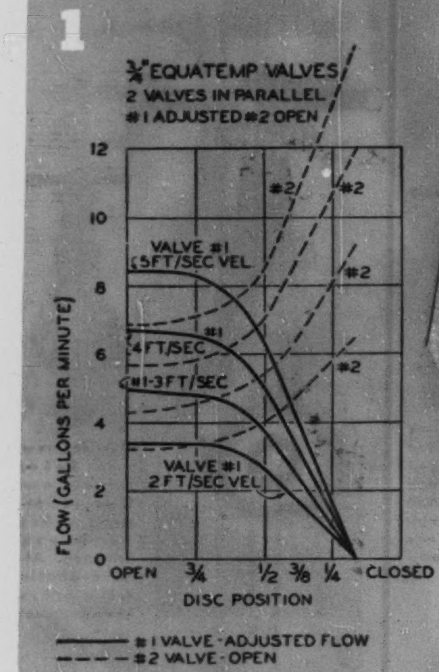
THE BETTER QUALITY . . . BIGGER VALUE LINE . . . IN BRASS, STEEL, IRON

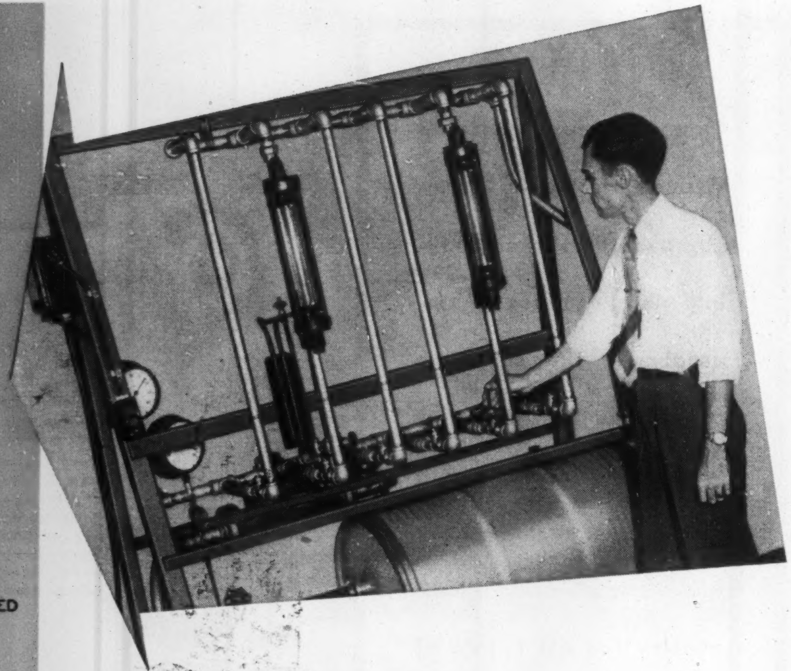
CRANE VALVES

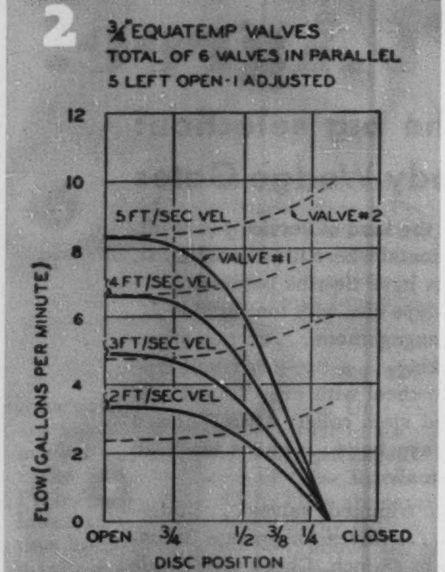
CRANE CO., *General Offices:* 836 S. Michigan Ave., Chicago 5, Illinois
Branches and Wholesalers Serving All Industrial Areas

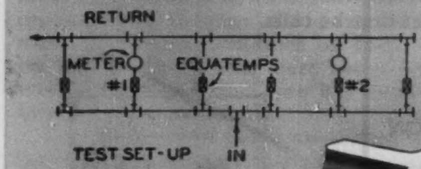
for the
THRIFTY BUYER

VALVES • FITTINGS • PIPE • PLUMBING • HEATING









QUESTION:

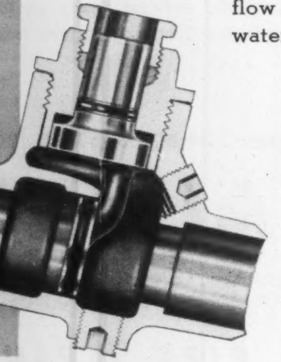
Does A Balancing Valve Really "Balance"?

Moving the disc in the O-B Equatemp® Balancing Valve has a definite effect on flow...both in the line in which the valve is installed and on flow in parallel lines in the same system.

That's the point demonstrated by O-B engineers on the special test device pictured here. The charts show how the test works. In chart one, one Equatemp is moved from full open to full closed position. As the valve closes, flow through a parallel open valve begins to increase. The second chart shows the same results when six valves are connected in parallel, although the effect of the adjustment is less because it is distributed over five other lines instead of one.

ANSWER:

An Equatemp Balancing Valve really balances. It can be used effectively to regulate flow in year-around air conditioning and hot water heating systems.



Also available with threaded ends.

Ohio Brass

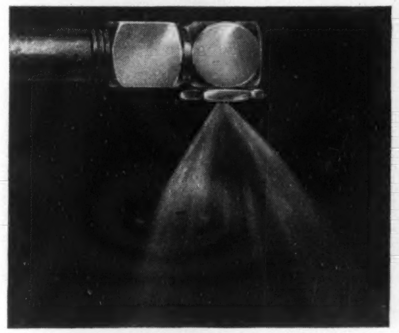
MANSFIELD OHIO, U.S.A.

4462-V

NOZZLES ARE THE HEART OF COOLING EFFICIENCY

In early designs of large atmospheric cooling towers the water distributing system usually consisted of water box, flumes and distributing troughs. It was natural that engineers would look for a more efficient way to break up the water so that a greater area would be exposed to the cooling action of the air.

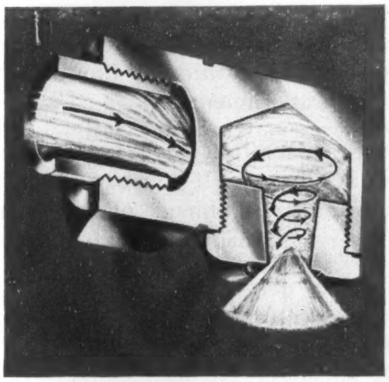
The first nozzles used for this purpose were crude, but a big step forward. After many refinements the Rotojet nozzle emerged as best suited for this work. It provided a hollow cone spray with remarkable fluid break-up.



For long life, low maintenance and high efficiency, cooling tower nozzles should be clog-proof and provide uniform spray patterns.

The Rotojets have no moving parts. They operate on the whirl chamber principle and are completely clog-proof under normal working conditions.

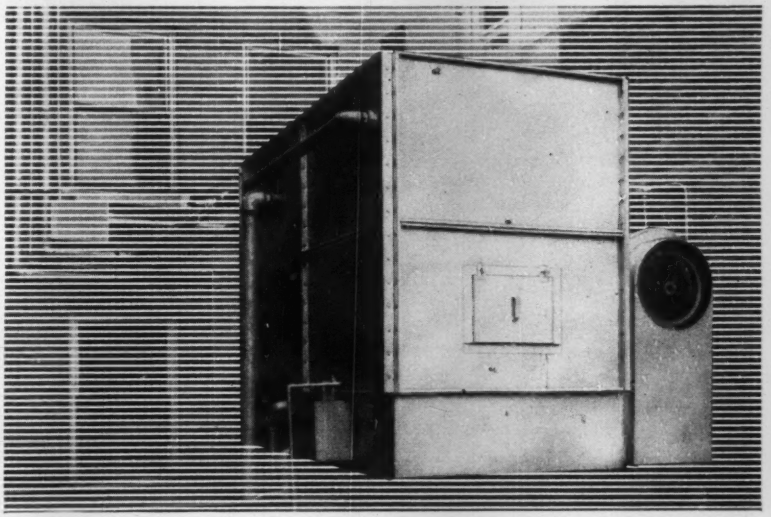
Engineers like the Rotojet for cooling tower installations because it is a precision-made nozzle. It is made in a wide range of sizes, permitting them to control the volume of water handled by a tower at a specified water pressure. This is important in the calculation of water to air ratios... the very heart of all cooling operations.



The whirl chamber principle of Rotojet nozzles gives maximum fluid break-up without the use of moving parts. This type of nozzle is clog-proof.

Full information on Rotojet nozzles and their many applications may be obtained by writing direct to the manufacturer, the Binks Manufacturing Company, 3118-38 Carroll Ave., Chicago 12, Ill.

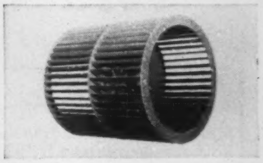
Binks series 3-B **cooling towers**



So-o Quiet...

Hotel guests sleep undisturbed

Guest rooms are only a few feet from the Binks cooling tower installed in the light court of the Malburne Hotel, Durham, N. C. But no one has complained or lost a wink of sleep. Binks cooling towers of the Series 3-B type are exceptionally quiet and are ideal for use where any noise at all would be objectionable.



Here's one reason why these towers are so quiet

Binks squirrel-cage blowers provide ample air movement while running at quiet speeds... far slower than the noisy propeller fans used in conventional towers.

You pay no more for this *extra quiet operation* and you get all these additional advantages:

- Controlled air movement through the tower makes Binks Series 3-B units independent of natural breezes.
- Air current moves in opposite direction to downward water flow. This accelerates the cooling action.
- Only dry air passes through the air propulsion assembly. Corrosion and maintenance are thus reduced.
- Non-clogging ROTOJET nozzles produce fine fluid break-up for maximum cooling.

A COMPLETE LINE OF NATURAL DRAFT AND MECHANICAL DRAFT COOLING TOWERS AND INDUSTRIAL SPRAY NOZZLES

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No. 47-A—Type 2-B (3 to 30 tons)
No. 47-B—Type 3-B (1 to 108 tons)
No. 47-D—Type B-23-B (2 to 3 tons)

Binks

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3118-38 Carroll Ave., Chicago 12, Ill.

Gentlemen: Please rush FREE Cooling Tower Bulletins as checked:

☐ Bulletin 47-A ☐ Bulletin 47-B ☐ Bulletin 47-D

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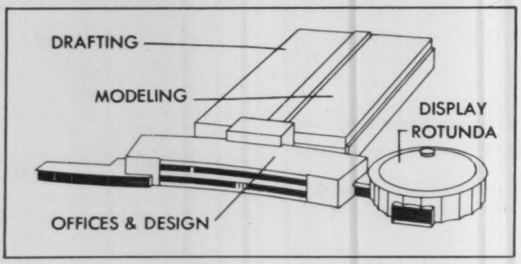
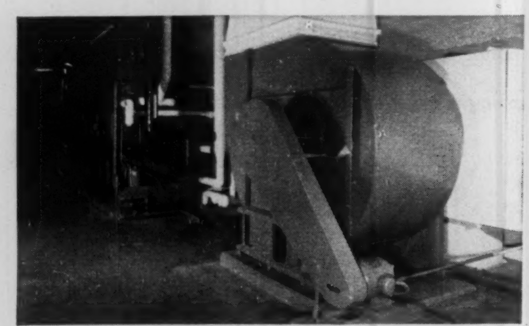
Advanced Styling Section of Ford Motor Company's new $11.5 million Styling Building, Dearborn, Michigan.

Ford "dream shop" has built-in climate!



The design-office wing and display rotunda are served by a central system. It includes: 7 supply fans; 34 exhaust fans; heating and cooling coils and sprayed-coil dehumidifiers — all furnished by American Blower.



Air for drafting rooms and modeling studios is conditioned by 24 specially built, automatically controlled American Blower Air-Conditioning Units. Each unit contains heating and cooling coils and capillary air washers.

This "dream shop" at the Ford Engineering Staff's Advanced Styling Section is just one of many styling areas which depend on clean, conditioned air.

For example, in 12 roomy studios clay-modeling teams work under lights which produce shadowless illumination — and intense heat! To absorb this heat and provide the proper climate for working with clay models, specially designed air-conditioning systems were installed for each studio and drafting room. American Blower Air Handling and Air-Conditioning Equipment was used for this unusual assignment.

The expert know-how of American Blower engineers is on tap for industry at all times. If you have an air-handling or air-conditioning problem, phone your nearest American Blower or Canadian Sirocco Branch Office.

AMERICAN BLOWER CORPORATION, DETROIT 32, MICHIGAN
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Division of American Radiator & Standard Sanitary Corporation

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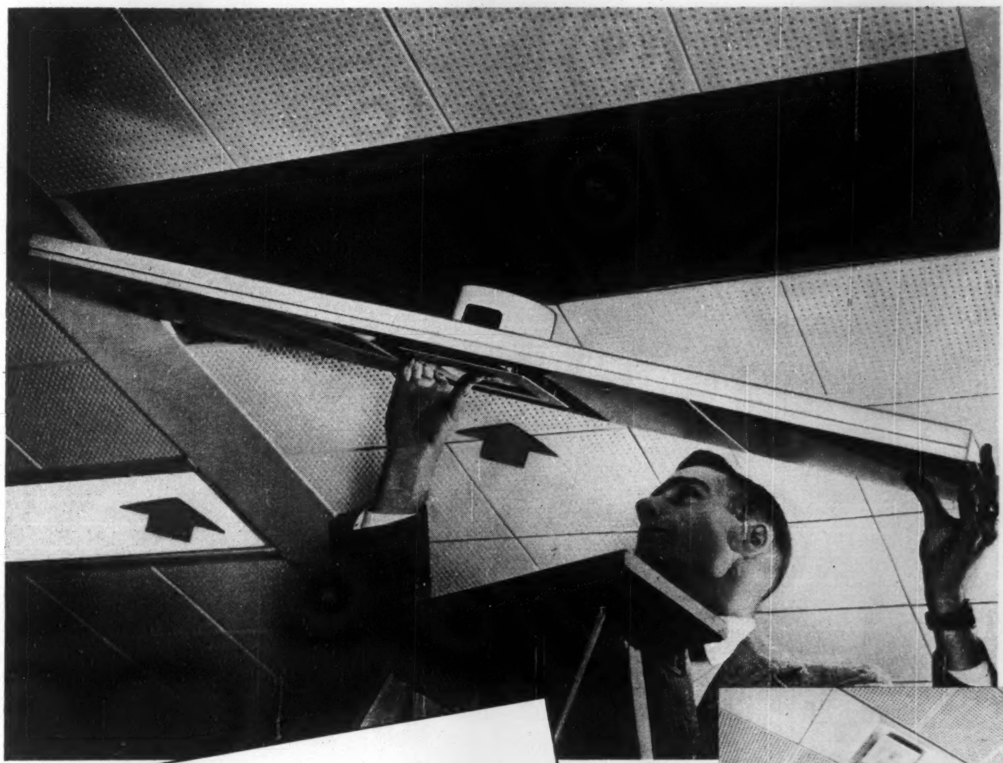

Announcing kno·draft

panel type air diffusers

ACTUALLY PART of the ceiling, Kno-Draft Panel Type Air Diffusers fit precisely into the acoustical tile pattern, creating a unified "dead level" surface that is pleasing to the eye.

FLEXIBLE TUBING connects Kno-Draft Panels to ducts, permits wide latitude in installation. Panels may be moved as necessary without affecting efficiency or requiring change in ductwork.

ESPECIALLY DESIGNED for acoustical suspended ceilings, Kno-Draft Panel Type Air Diffusers can be installed as fast and easily as the acoustical tiles themselves—a matter of minutes. Ducts and tubing connections are readily accessible.

Furthermore, Kno-Draft Panels do not have to be lined up with ducts. They can be placed anywhere on the ceiling—are connected to ducts by special patented flexible tubing. This allows great flexibility and permits relocation of offices and partitions without moving ductwork.

Air volume through Kno-Draft Diffusers is adjustable *after* installation. Air velocities remain constant at all damper settings. Mail coupon today for full information on this new exclusive development in air diffusion. Connor Engineering Corporation, Danbury, Conn.

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panel type air diffusers

see our catalog in ARCHITECTURAL FILE or write for copy

CONNOR ENGINEERING CORPORATION
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Without obligation, please send your Bulletin K-36 describing the new Kno-Draft Panel Type Air Diffusers.

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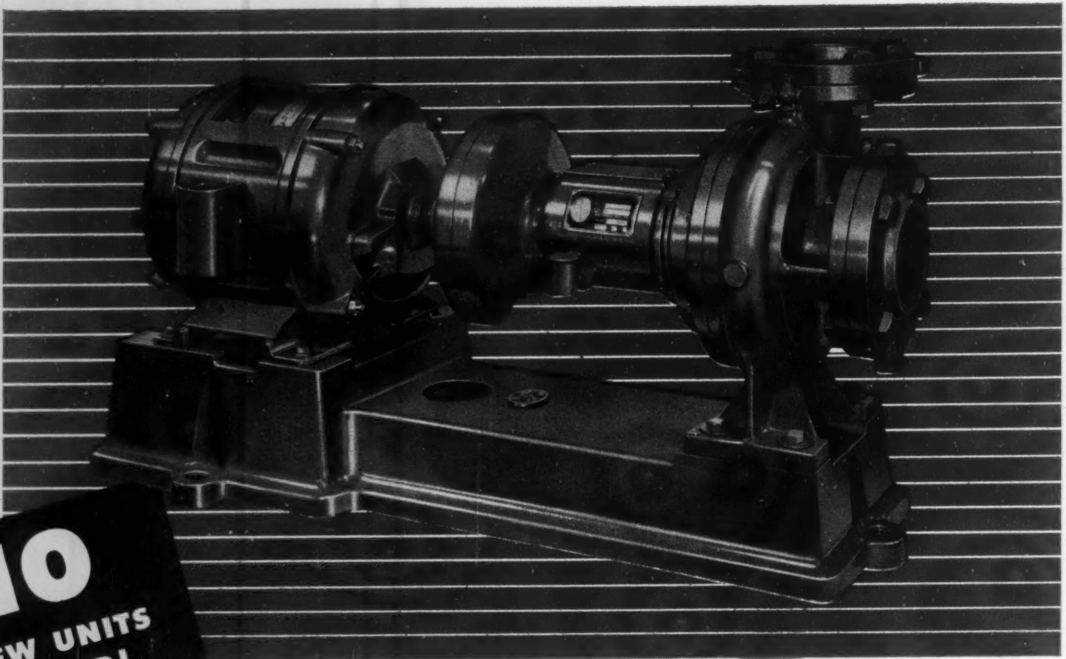

10
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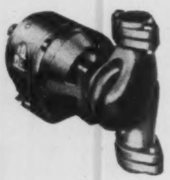
UNIVERSAL PUMPS

NO JOB TOO BIG OR TOO SMALL FOR B & G *HYDRO-FLO* HEATING PUMPS



¾″ to 1½″ Boosters
Capacities to 47 GPM
—heads to 12 ft.

2″ to 3″ Boosters
Capacities to 128
GPM—heads to 19 ft.

PD Boosters—3″
Capacities to 170
GPM—heads to 30 ft.

Enlarged line meets all pumping requirements of larger forced hot water heating systems

For your larger forced hot water heating installations, the *B & G Universal is the pump!* It's the big brother of the famous B & G Booster, with all of the basic features of this biggest-selling circulator. The water-tight seal, for example, polished machine steel shaft with integral thrust collar, extra-long bronze bearings and oil lubrication. Like the Booster, it can be serviced without removing from the line.

Obviously, the B & G Universal is *not* just another centrifugal pump. It is engineered in every detail to assure that all-important quality of *quietness!*

With heads to 78 feet and capacities to 1,200 GPM, the B & G Universal Pump is suitable for application in garden apartments, industrial plants, institutions and commercial buildings. You can install it with complete confidence in its efficiency and all-around dependability.

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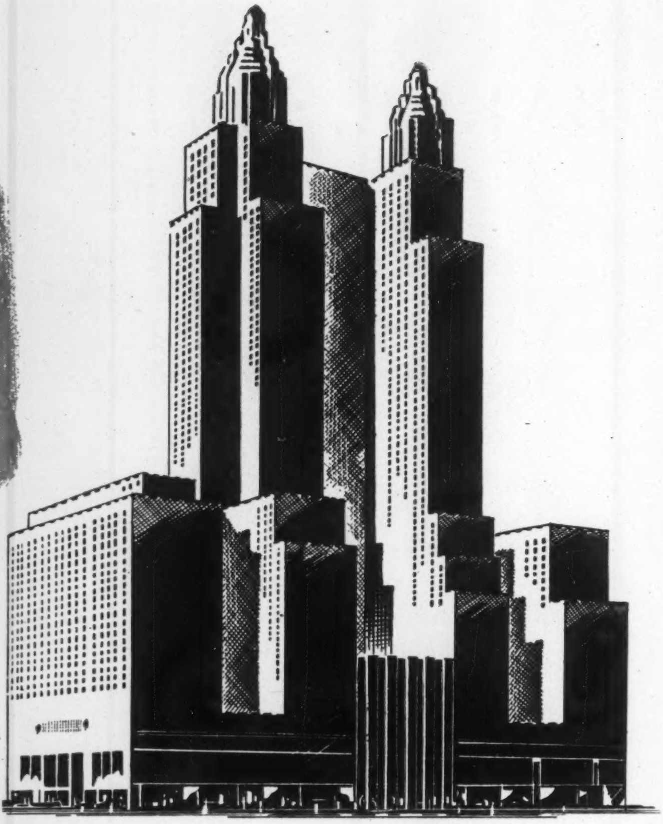

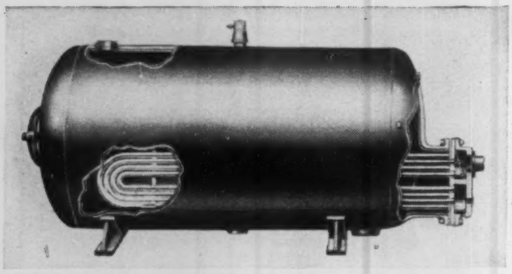

p-k copper-lined hot water storage heaters at the Waldorf

Travellers from all over the world enjoy luxury living at the famous Waldorf-Astoria Hotel on New York's Park Avenue.

Contributing to this luxury is a dependable source of clean hot water—enough for a town of 10,000 people who fill the Waldorf's 2200 guest rooms and public halls. Abundant, pure, rust-free hot water is always on tap direct from **p-k** *copper-lined* hot water storage heaters.

These heaters are really two heaters in one. Inside a heavy steel shell is a complete copper heater. Thus all the non-corrosive and durable qualities of copper are combined with the superior strength of steel. Water touches only non-rusting copper.

Consider your own hot water needs. **p-k** copper-lined hot water heaters are economical in first cost because of their unique design, outlast ordinary heaters and require the minimum in maintenance. **p-k**'s 73 years of experience gives you two things — a satisfactory product and a sound guarantee. Why not learn more about **p-k** copper-lined heaters.

Full information and engineering help is yours for the asking.

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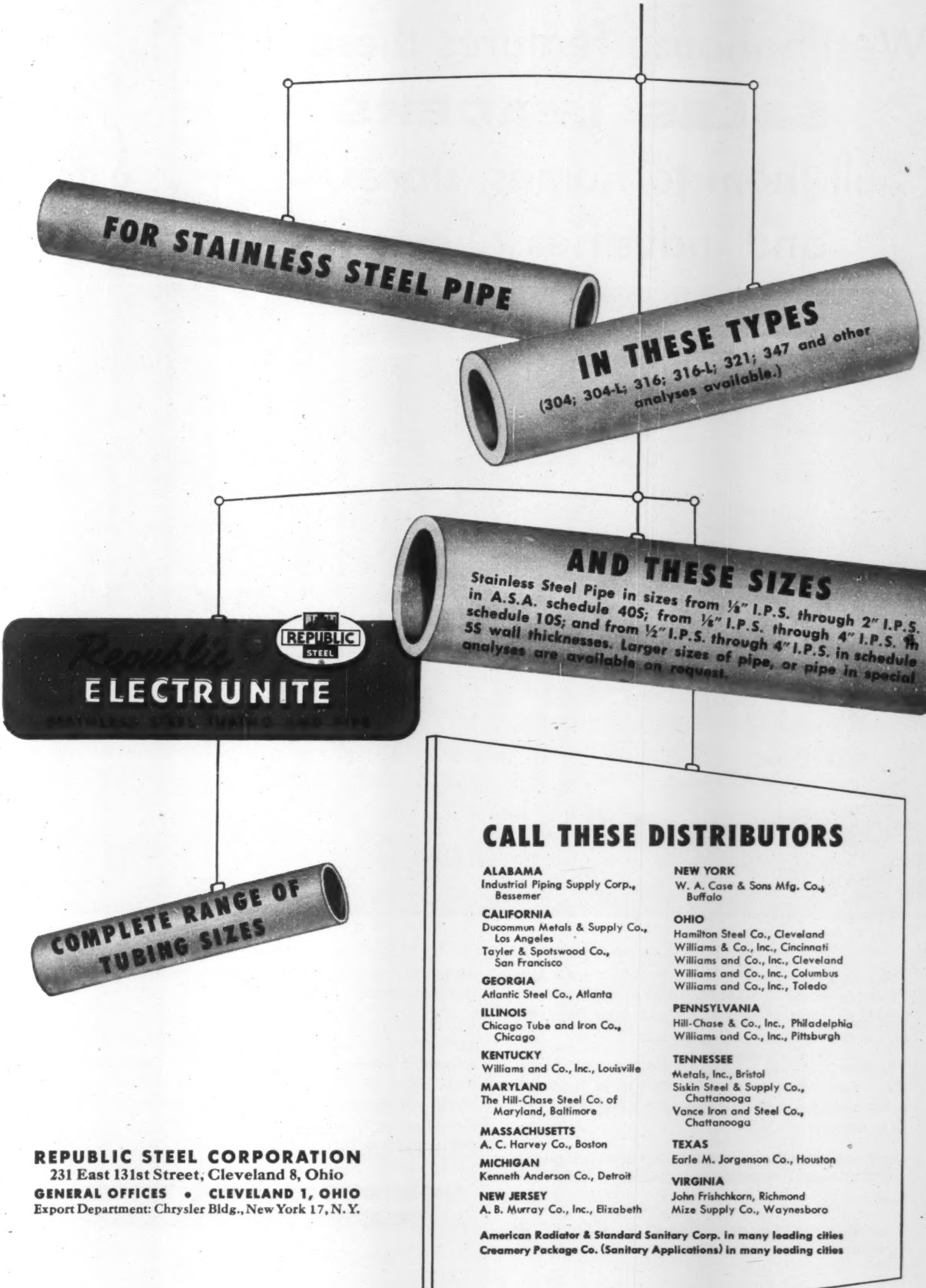

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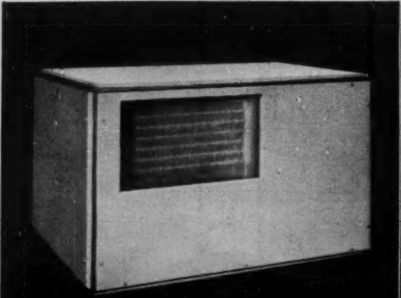
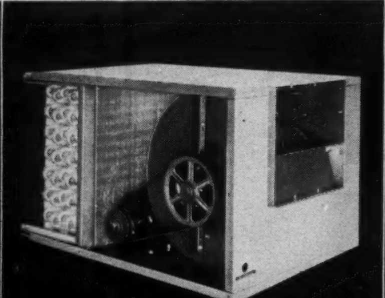
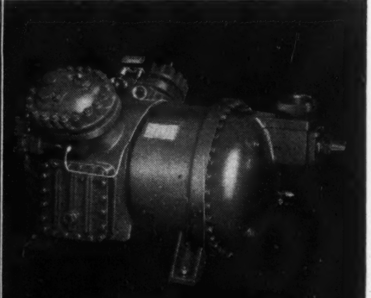


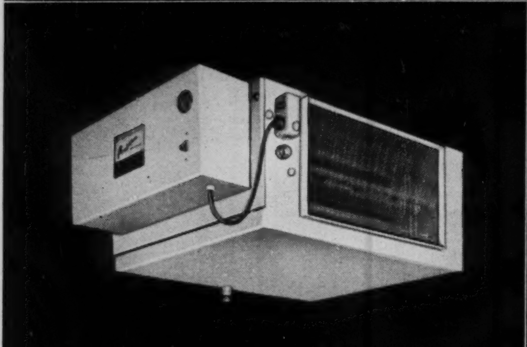
2 HP UNITAIRE



AIR COOLED CONDENSER



CLS-501 COMPRESSOR



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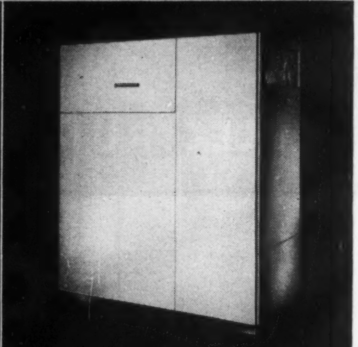

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The new 2 Hp Comfort Cooler priced for mass sales to shops, offices and homes. Ideal as a price leader to attract many prospects for your sales force, this unit is also available in 3 and 5 h.p.

The PRECIPITRON. This is an electronic air cleaner that gives indoor relief from allergies (a market in itself) as well as simplified housework and drastic cuts in redecorating expense.

Dealers where water is scarce or expensive will get new retail "leverage" with Westinghouse Air Cooled Condensers.

And the new line includes a smart packaged unit for stores and offices—as well as the Westinghouse Heat Pump for modern all-electric living.

For details on these units, as well as Westinghouse air conditioning compressors and equipment for field-assembled systems, look in your Classified Telephone Book today for the name of your nearest Westinghouse Air Conditioning Distributor. Or write Air Conditioning Division, Westinghouse Electric Corporation, Hyde Park, Boston 36, Mass.

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Straight lengths of Reading Type L tubing in sizes up to ¾" automatically receive extra processing for sag-resistance and easy bending. No special ordering—no extra cost! This is just one instance of the extent to which Reading goes to give you product and service second to none in the industry.

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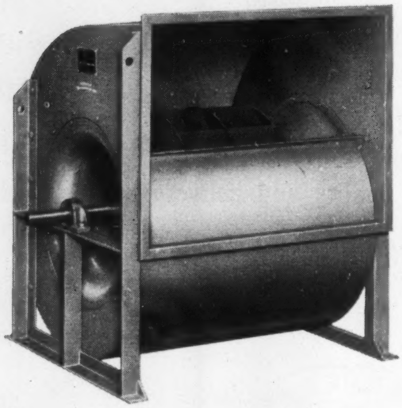

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Sure, that old pump still works,

but how much does it cost to keep?

That rugged old pump of yours may not be the bargain that it seems. Let's do some arithmetic. If the efficiency of the old pump is 75% vs. the 85% efficiency of the new pump, you are paying more to keep it than you would to replace it. That's because a new unit of equivalent output uses less power. Thus it soon saves its own cost — then begins to pay dividends.

Let's take a specific example—a small general service pump

Old pump efficiency 70%	**28.9 BHP**
New pump efficiency 79%	**25.6 BHP**
	3.3 BHP Saving

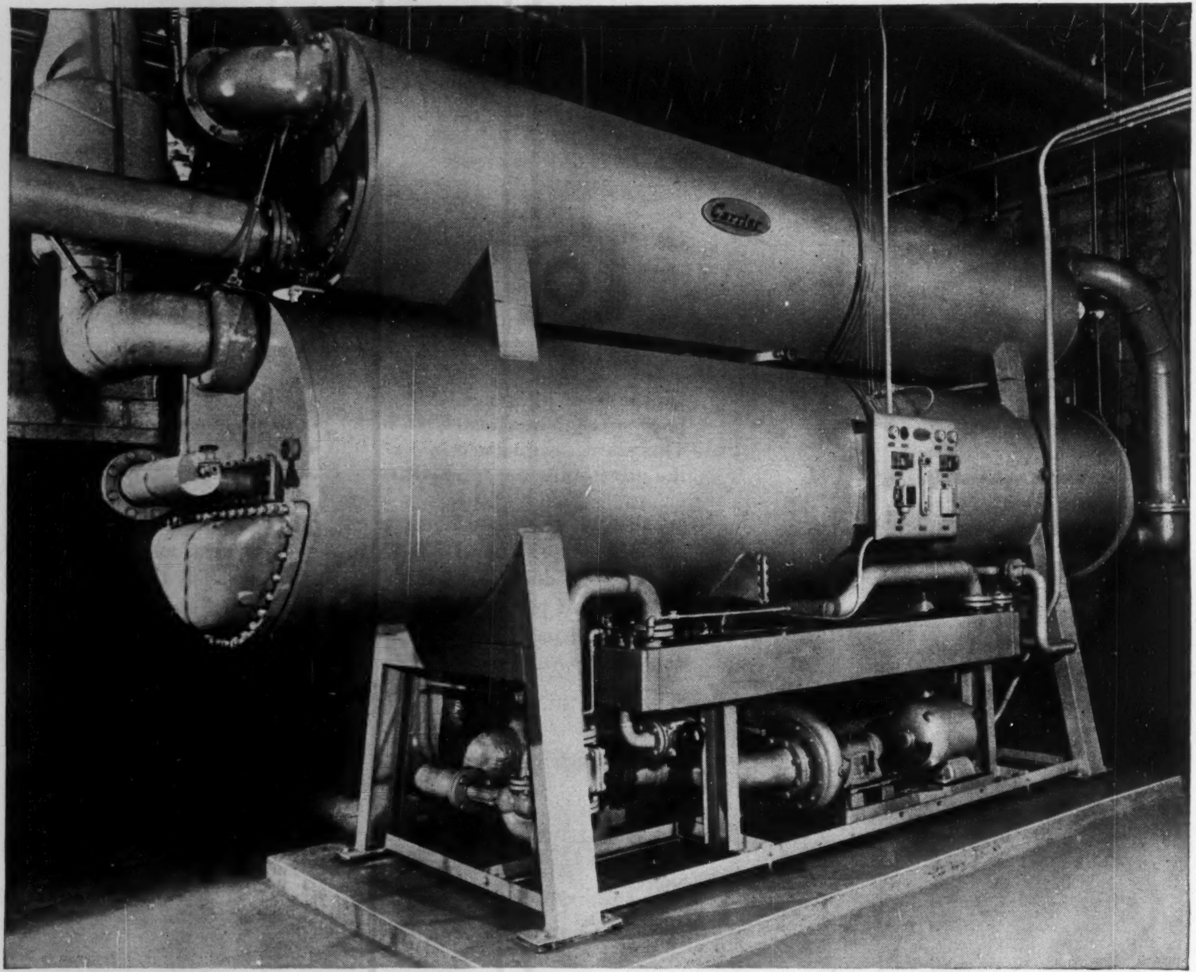
On the basis of 1¢ per KWH, the 3.3 BHP saving for a 6000-hour year (approximately 16 hours per day) amounts to $150. This saving, capitalized in 4 years at 4% adds up to $630. Yet the price of the new pump that saves $630 is only $438.

What would the pump replacement profit be in your particular case? Your De Laval representative can tell you exactly — in dollars and cents — as soon as he has the basic facts on your present installation. Call him in today or write to De Laval for Pump Fax Bulletin which includes a valuable "power-savings" chart.

DE LAVAL *Pumps*

DE LAVAL STEAM TURBINE COMPANY
871 Nottingham Way, Trenton 2, New Jersey

DL237A

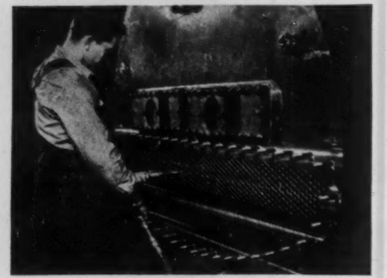


This 350-ton Carrier Absorption Machine is installed at the Joseph Horne Co. Suburban Store in Brentwood Borough, Pennsylvania.

Carrier Absorption Refrigerating Machine uses heat to cut cooling costs

—and AnacondA Cupro Nickel Tubes are again called on for economical quality performance in industry

Until recently, plant and building engineers have been hung on the horns of a cooling dilemma; how to use low pressure steam—frequently exhausted as waste—for chilling water for air conditioning and process cooling. No economical way seemed to exist to harness this heat as a work horse for cooling.



Rolling-in AnacondA Cupro Nickel Tubes in absorber for new Carrier Absorption Machine.

Carrier Corporation, leading manufacturer of air conditioning and refrigerating equipment, found the solution in *absorption refrigeration*. In 1942, they installed the first pilot plant at the Carrier laboratory using water as a refrigerant and lithium bromide as the absorbent. Since then, a growing number of these large capacity units have been put into operation. They have few moving parts, are practically vibration-free, weigh less per rated ton, and adjust automatically to load.

Carrier selected AnacondA Cupro Nickel Tubes for use in these machines because of their excellent service record for trouble-free performance under all operating conditions.

What are your condenser and heat exchanger problems? In selecting the proper tube alloy, the experience of our Technical Department is freely available to you. Use it as a short cut to the right solution. Write to *The American Brass Company, Waterbury 20, Connecticut. In Canada: Anaconda American Brass Ltd., New Toronto, Ontario.*

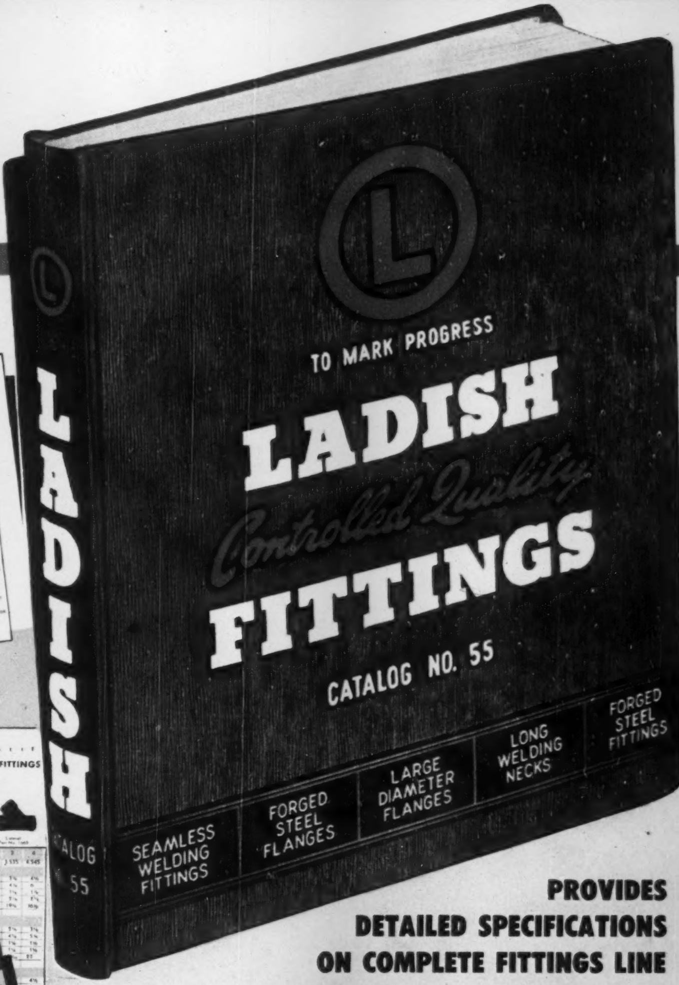
54103

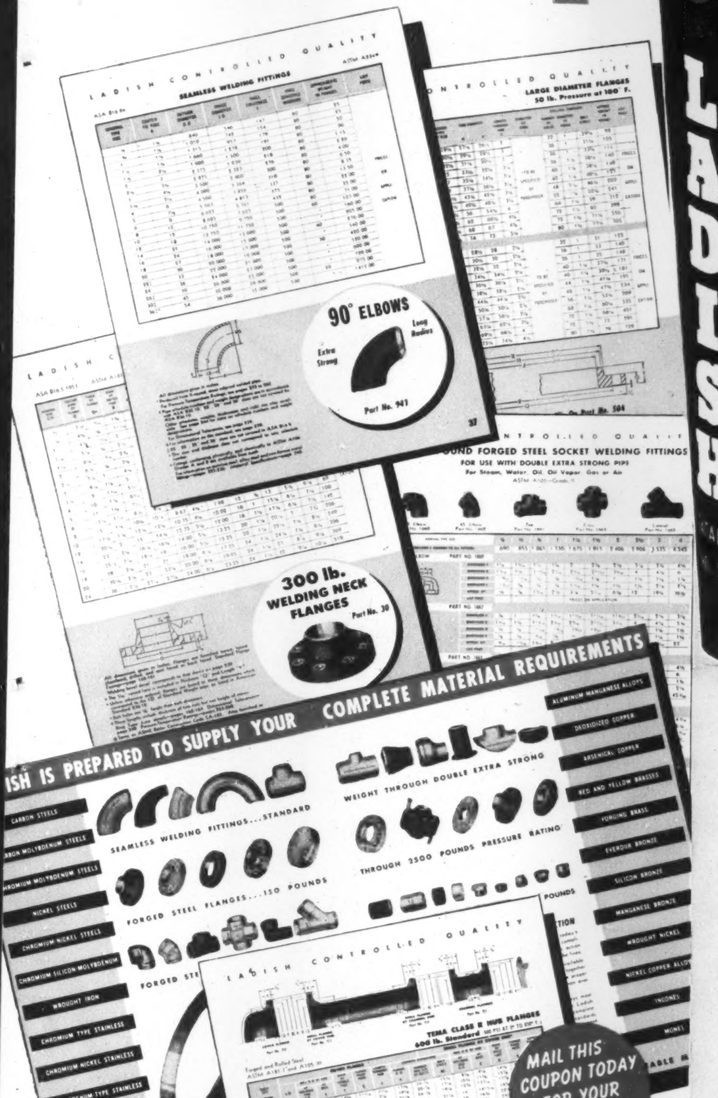
FOR EFFICIENT HEAT TRANSFER

AnacondA®

HEAT EXCHANGER TUBES

SEND FOR YOUR NEW 304-PAGE LADISH FITTINGS CATALOG NOW


LADISH
CATALOG NO. 55
TO MARK PROGRESS
LADISH
Controlled Quality
FITTINGS
CATALOG NO. 55
SEAMLESS WELDING FITTINGS
FORGED STEEL FLANGES
LARGE DIAMETER FLANGES
LONG WELDING NECKS
FORGED STEEL FITTINGS


LADISH CONTROLLED QUALITY
SEAMLESS WELDING FITTINGS
90° ELBOWS
Long Radius
Extra Strong
Part No. 941
LARGE DIAMETER FLANGES
50 lb. Pressure at 100° F.
FORGED STEEL SOCKET WELDING FITTINGS
FOR USE WITH DOUBLE EXTRA STRONG PIPE
300 lb. WELDING NECK FLANGES
Part No. 30
LADISH IS PREPARED TO SUPPLY YOUR COMPLETE MATERIAL REQUIREMENTS
SEAMLESS WELDING FITTINGS...STANDARD
WEIGHT THROUGH DOUBLE EXTRA STRONG
FORGED STEEL FLANGES...150 POUNDS
THROUGH 2500 POUNDS PRESSURE RATING
CARBON STEELS
CARBON MOLYBDENUM STEELS
CHROMIUM MOLYBDENUM STEELS
NICKEL STEELS
CHROMIUM NICKEL STEELS
CHROMIUM SILICON MOLYBDENUM
WROUGHT IRON
CHROMIUM TYPE STAINLESS
CHROMIUM NICKEL STAINLESS
MOLYBDENUM TYPE STAINLESS
ALUMINUM MANGANESE ALLOYS
DEOXIDIZED COPPER
ARSENICAL COPPER
RED AND YELLOW BRASSES
FORGING BRASS
EVERDUR BRONZE
SILICON BRONZE
MANGANESE BRONZE
WROUGHT NICKEL
NICKEL COPPER ALLOY
INCONEL
MONEL
TEMA CLASS R HUB FLANGES
MAIL THIS COUPON TODAY FOR YOUR LADISH CATALOG

PROVIDES DETAILED SPECIFICATIONS ON COMPLETE FITTINGS LINE ...PLUS USEFUL TECHNICAL DATA

Here are detailed dimensions, weights and specifications to assist in selecting proper fittings for any application... plus useful engineering and technical data. Major sections include:

68 PAGES BUTT WELDING FITTINGS
Available in Standard through Double Extra Strong weights... in sizes ½ through 42 inches.

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Available in 150 through 2500-pound pressure ratings ... in sizes ½ through 24 inches.

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Available in a complete range of types and pressure ratings... in sizes up to 160 inches in diameter.

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Featuring data on properties of materials and a comprehensive table of piping specifications.

56 PAGES TECHNICAL DATA TO SIMPLIFY PIPING DESIGN PROBLEMS

LADISH CO.
Dept. HPAC, Cudahy, Wisconsin

Please send me, without cost or obligation, the new 304-page Ladish Fittings Catalog No. 55.

Name ____________________

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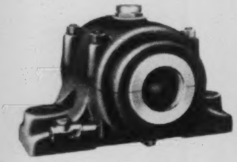
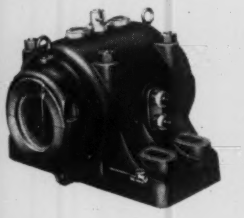
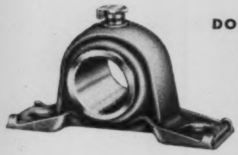
WHEREVER QUIET IS REQUIRED



SLEEVOIL PILLOW BLOCK
A precision-built, ring-oiling babbitted bearing, self aligning and exceptionally quiet in operation.

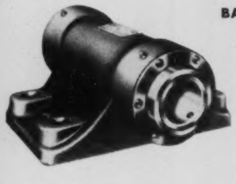


WATER-COOLED SLEEVOIL
Sleevoil Pillow Block, designed for industrial applications where high temperatures are encountered.



DODGE BRONZOIL
Capillary bronze bushing has capacity of one-third its volume in oil. Reservoir with close fitting wick around bushing provides ample lubrication. Both pillow blocks and flange units.

BRONZE BUSHED PILLOW BLOCK
Designed for arrangement No. 2 installations. Two bronze bushings of high lead content mounted in one cast iron housing. Special T-section rings for dependable lubrication.



BALL BEARING PILLOW BLOCK
For anti-friction installations. Two single row, deep groove ball bearings in one cast iron housing. Extended inner races carry the shaft.

CALL THE TRANSMISSIONEER
your local Dodge Distributor, for information about the entire Dodge line of bearings for fan and blower service. Look for his name in the Classified Telephone Directory under "Power Transmission Equipment," or write to the factory.

DODGE BEARINGS

FOR FAN AND BLOWER SERVICE

FOR INSTALLATIONS in hospitals, auditoriums, office buildings—wherever quiet operation is essential, Dodge offers the perfect answer to the bearing problem. Dodge manufactures a *complete line* of bearings for fan and blower service, all engineered and precision-built for exceptional quietness in operation.

The Dodge line has been developed in close cooperation with the manufacturers of fan and blower equipment, to meet the specialized requirements in this field, efficiently and economically. For complete information on Dodge fan and blower bearings see your Dodge Distributor—or write the factory.

DODGE MANUFACTURING CORPORATION
1600 UNION STREET, MISHAWAKA, INDIANA

DODGE
of Mishawaka, Ind.

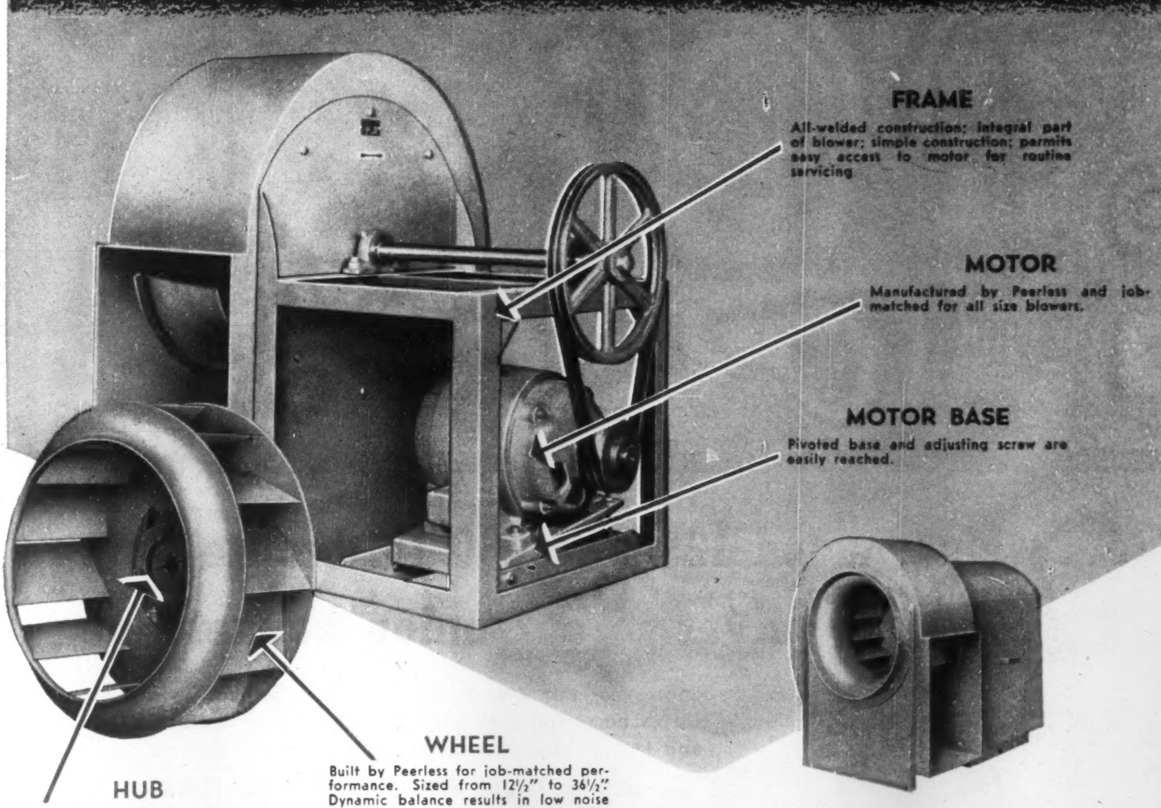
NAME PLATES

FOR YOUR NAME PLATE REQUIREMENTS, WRITE OUR SUBSIDIARY,
CHICAGO THRIFT-ETCHING CORPORATION, 1555 SHEFFIELD AVENUE, CHICAGO 22, ILLINOIS

ENGINEERED TO MEET ALL STANDARDS...

New PEERLESS Backward Curve Blower

WITH SELF-LIMITING HORSEPOWER CHARACTERISTICS



FRAME
All-welded construction; integral part of blower; simple construction; permits easy access to motor for routine servicing.

MOTOR
Manufactured by Peerless and job-matched for all size blowers.

MOTOR BASE
Pivoted base and adjusting screw are easily reached.

HUB
Wheel rides smoothly and quietly on heavy cast-iron hub for long life.

WHEEL
Built by Peerless for job-matched performance. Sized from 12½" to 36½". Dynamic balance results in low noise level. Streamlined venturi inlet. CFM ratings from 3,370 to 17,490.

• Here's the answer to better blower performance on the big jobs—schools, hospitals, office buildings, etc. — the new PEERLESS BACKWARD CURVE BLOWER. It has the features engineers, wholesalers and contractors said they wanted most . . . greater CFM ratings . . . compactness in all sizes . . . increased efficiency . . . quiet operation.

Peerless design features give you a better blower which you can specify with complete confidence. Check them: Heavy cast-iron hubs for extra wheel support. Wheels with matching spun cones and streamlined venturi inlets that permit air to enter, pass and exit smoothly and quietly. Blowers sized to NAFM recommendations—from 12½" to 36½". Ratings that are tested accurate. Self-limiting horsepower characteristics. With these Peerless features, you can engineer a job to perfection.

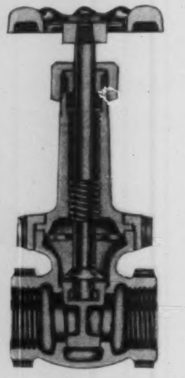
Write or call Peerless today for full information about the new Backward Curve Blower. You can get **immediate** delivery on all Peerless Fans and Blowers.

"SMOOTHEST PERFORMERS ON THE MARKET"

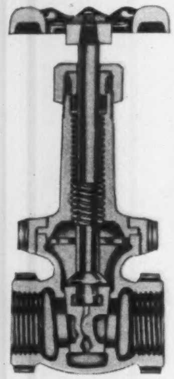
FAN AND BLOWER DIVISION
THE PEERLESS ELECTRIC COMPANY
1409 WEST MARKET ST. · WARREN, OHIO

Peerless Electric

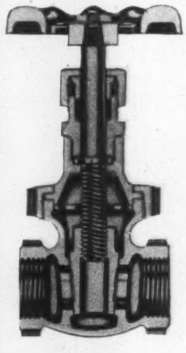
Oh, I see



Solid wedge, inside screw, rising stem



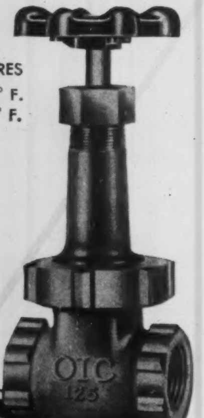
Split wedge, inside screw, rising stem



Solid wedge, non-rising stem

. . . we've added 125 and 150 lb. bronze gate valves to our union bonnet line

Success of our 200 lb. line of union bonnet bronze gate valves necessitates expansion of the line to include 125 lb. and 150 lb. classes. Sizes range from ¼ to 2 inches.



WORKING PRESSURES
125 lb. W. S. P. 400° F.
150 lb. W. S. P. 400° F.

NOTE THESE ENGINEERING FEATURES:

This line has a flat seat on the bonnet which mates against the body, providing adequate bearing area for sealing.

Tight bonnet joint, but easy access to interior for inspection and service.

Full ports permit unobstructed flow.

Back-seating arrangement permits repacking while under pressure.

Split wedge has ball in socket contact . . . permits wedge to adjust itself to seat.

Slip-on type "T" head stem-to-wedge connection.

Lug-type hexes make valves compact and provide a better wrench-gripping surface.

To learn more about this expanding line of valves, write for our *Union Bonnet Bronze Gate Valve Catalog Folder.*

THE OHIO INJECTOR COMPANY • WADSWORTH, OHIO

OIC
FOUNDED 1883

VALVES | **FORGED & CAST STEEL, LUBRICATED PLUG, BRONZE & IRON**

BURNHAM STEEL BOILERS ARE RATED RIGHT!

...Every BURNHAM Steel Boiler is Rated for Nominal Load–NOT Top Capacity

This *Quickly* adds up to:

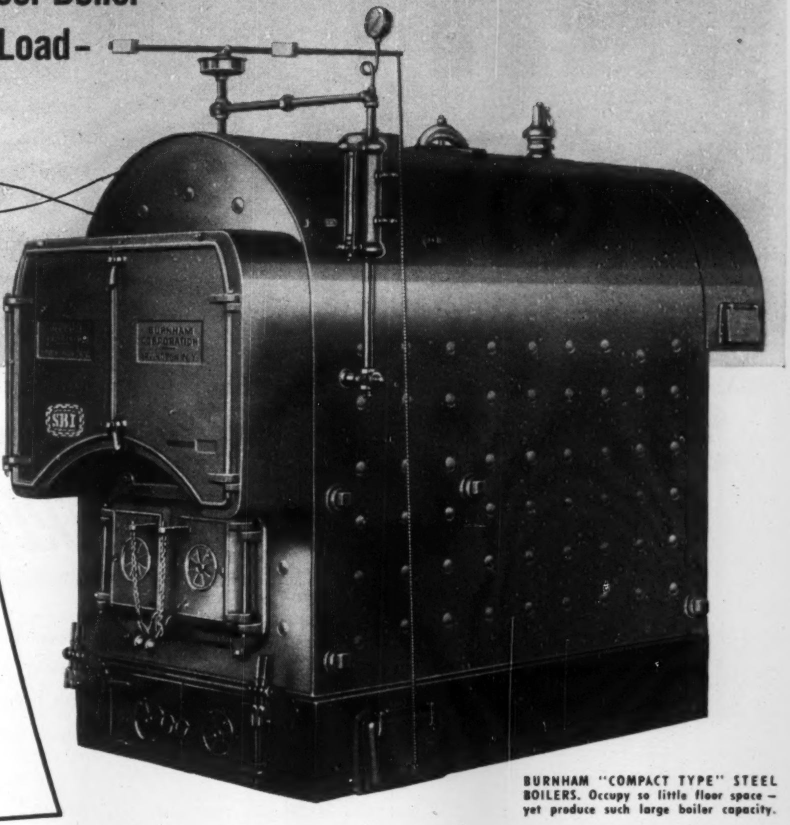
Greater Dependability

Longer Useful Life

Greater Efficiency

Greater Safety

Lower Costs



BURNHAM "COMPACT TYPE" STEEL BOILERS. Occupy so little floor space – yet produce such large boiler capacity.

HERE'S WHY

Conservative oldtimers are not deluded by "top capacity" ratings for a boiler. They know from long experience that only *nominal-rated* boilers give them the reserve which makes for greater efficiency, lower maintenance and longer useful life. Nominal-rated boilers mean protection against fluctuating loads, emergencies and expansion.

BURNHAM STEEL BOILERS are *all* nominal-rated, a fact you can prove for yourself or which we will gladly prove to you. They all conform fully to SBI ratings. The selection of a BURNHAM BOILER has many times been the difference between a good buy and a costly mistake. When you buy or specify a BURNHAM "COMPACT TYPE" STEEL BOILER, you automatically avoid any chance of unsatisfactory performance, arising from rating misunderstandings.

Burnham Corporation

BOILER DIVISION

Irvington New York

HP-54

BURNHAM CORPORATION
Boiler Division
Irvington, New York

Please send me 8 page catalog with NOMINAL-RATINGS on BURNHAM "COMPACT TYPE" STEEL BOILERS.

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Address____________________

City____________________ State__________

THIS IS IT!

The famous
MOLDED
POROUS CORE
that makes the

Sporlan *Catch-All* Filter-Drier
the World's PEAK PERFORMER

It is molded of minute particles of a highly efficient desiccant. Then, after complete assembly, it is activated to the *highest degree of dryness* . . . a minimum of four hours at over 500° F., then sealed against any loss of activation before installation!

It dries the refrigerant down to an extremely low end point . . . a point so low that any remaining moisture is absolutely harmless!

Its tremendous cylindrical, tri-dimensional, *porous* filtering area unquestionably offers the only true filtering device capable of filtering out foreign matter as minute as 9 microns with negligible pressure drop.

It cannot powder, it cannot pack, and the refrigerant cannot by-pass it or channel around it.

It removes harmful corrosive acids which cause the most serious problems in refrigeration and air conditioning systems today.

So . . . if you want perfectly clean, perfectly dry refrigeration and air conditioning systems buy Sporlan Catch-Alls, the *Perfect Filter-Drier!*

Ask your wholesaler for the Sporlan Bulletin 40-10 today! You'll find Catch-Alls available in progressive sizes from 3 to 192 Cu. in. in flare or sweat connections.

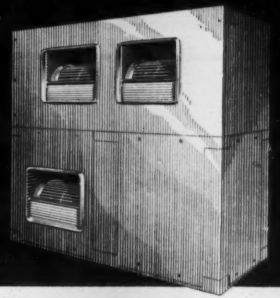
SPORLAN VALVE COMPANY
7525 SUSSEX AVENUE • ST. LOUIS 17, MO.

EXPORT DEPT. 89 BROAD STREET • NEW YORK 4, N. Y.

1 *of the many reasons why you will find it pays to sell Chrysler Airtemp*

Continuous and extensive advertising of ALL Chrysler Airtemp product lines

makes your selling job easier!



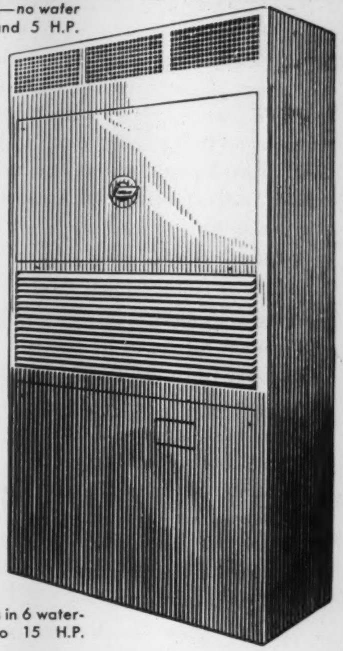
"Packaged" *Air-Cooled* Air Conditioners—*no water needed*, no plumbing required. 2, 3 and 5 H.P.

● The specific benefits of Chrysler Airtemp "Packaged" Air Conditioning to businesses and professions which constitute your best market are advertised consistently in 29 trade journals. In addition, extensive advertising on other Chrysler Airtemp products is constantly increasing acceptance of the Chrysler Airtemp name on *all* products which carry it.

For example, in this month of May alone, messages on Chrysler Airtemp Room Air Conditioners will appear in national magazines with a combined circulation of 11,720,345. Advertising on Chrysler Airtemp residential air conditioning will reach an additional 8,775,636 people in national magazines—also 300,000 builders, architects and contractors in leading building industry trade journals. Prominent news and business publications will carry the story of Chrysler Airtemp Air Conditioning for buildings to over 1,160,000 readers.

In this month, too, as every month, Chrysler Airtemp's popular full-color movie, "It's in the Air," will be shown to thousands of people throughout the country.

The tremendous impact of all this Chrysler Airtemp advertising is an important extra you sell with when you sell Chrysler Airtemp "Packaged" Air Conditioning. But only one of many! Check those additional extras described below. Then return convenient coupon for all of the detailed information you should have on the profitable Chrysler Airtemp Franchise.



Replacement or refund of money
Guaranteed by
Good Housekeeping
if not as advertised therein

"Packaged" Air Conditioners in 6 water-cooled models, from 2 to 15 H.P.

7 *more advantages you sell with when you sell Chrysler Airtemp...*

★ **Consumer Confidence**—people know the Chrysler Airtemp name—associate it with engineering leadership—have confidence in the products which carry it.

★ **Lower Installation Cost**—super-quiet operation permits use within or very close to areas to be cooled, reducing amount of ductwork required. All units shipped completely factory-assembled and tested.

★ **Assured Dependability**—Chrysler Airtemp pioneered "Packaged" Air Conditioning in 1937, has more units in use today than anybody else. All units are manufactured to exacting standards of precision in a modern, windowless, completely air conditioned factory. Each unit thoroughly inspected and tested before shipment.

★ **Advanced Engineering** by Chrysler Airtemp offers your customers features that mean more because they do more for them.

★ **5-Year Compressor Warranty**—covers replacement of compressor, freight and labor.

★ **More Complete Line**—9 models meet all requirements.

★ **More Local Selling Helps**—the broadest line of tested and proved local selling helps for dealers.

CHRYSLER AIRTEMP

heating • air conditioning for homes, business, industry

Airtemp Division, Chrysler Corporation, Dayton 1, Ohio

Airtemp Division of Chrysler Corporation HP&AC-5-54
P.O. Box 1037, Dayton 1, Ohio
I would like to know more about the Chrysler Airtemp Franchise.

Name____________________

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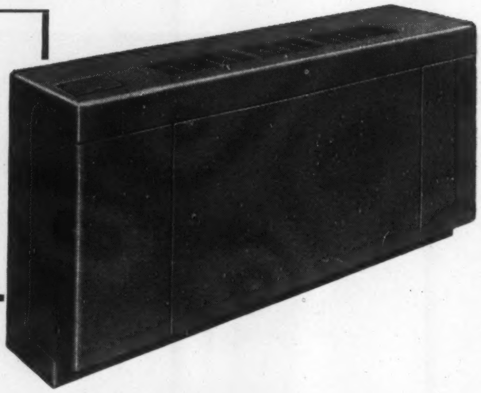
Simple, efficient, easy to install...

The REMOTAIRE
by
AMERICAN-Standard



- **Year 'round heating and cooling**
- **Central plant, multi-room installation**
- **Individual room temperature control**
- **Filters and circulates the air**
- **Single piping circuit**

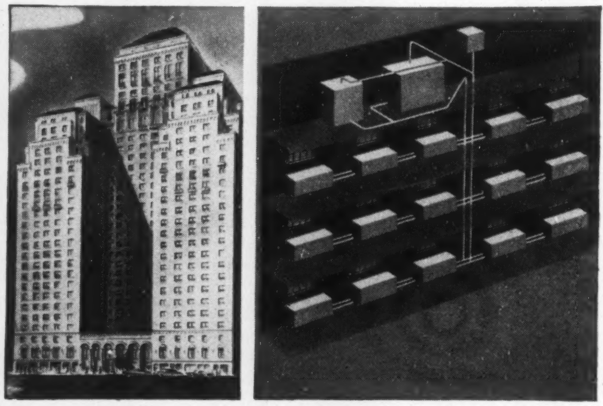
■ Remotaire installations are simple and direct. The same piping circuit carries chilled water for summer cooling, hot water for winter heating. There is no bulky ductwork. Water is conditioned in a central plant, yet temperatures can be controlled individually in each room where a unit has been installed.

Remotaire units have reversible coils for right or left hand connections. And each part of the unit is easy to get at.

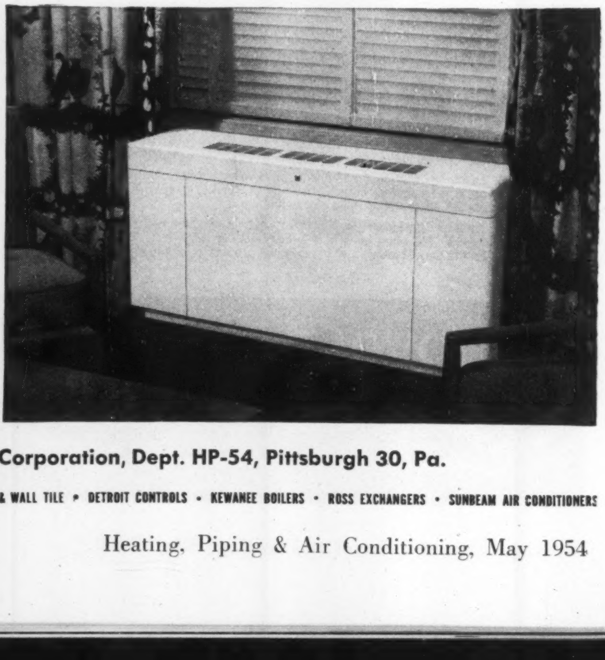
To meet all types of installation requirements Remotaire units are available in 200, 400, and 600 cfm capacities.

Your customers will like the Remotaire. Heating and cooling performance is outstanding. The installation looks good, too. Units come in handsome semi-gloss Cooltan jackets but can be painted to match the room interior if desired. Remotaire units can be installed free standing, partially recessed, or totally recessed.

Contact your local American-Standard sales office or your wholesale distributor for more information about Remotaire performance and installation, or write for literature—Form 417.



THE REMOTAIRE IS VERSATILE. An example of a Modernization System is the Park Sheraton Hotel of New York. The above rendering shows how simple the Remotaire piping is. Picture below illustrates our attractive Remotaire unit in a Park Sheraton Hotel room.

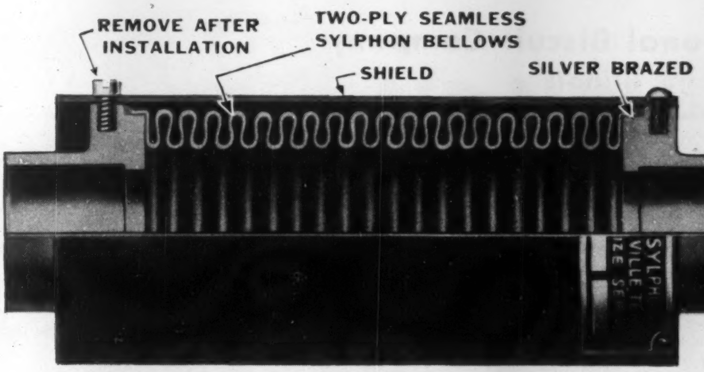


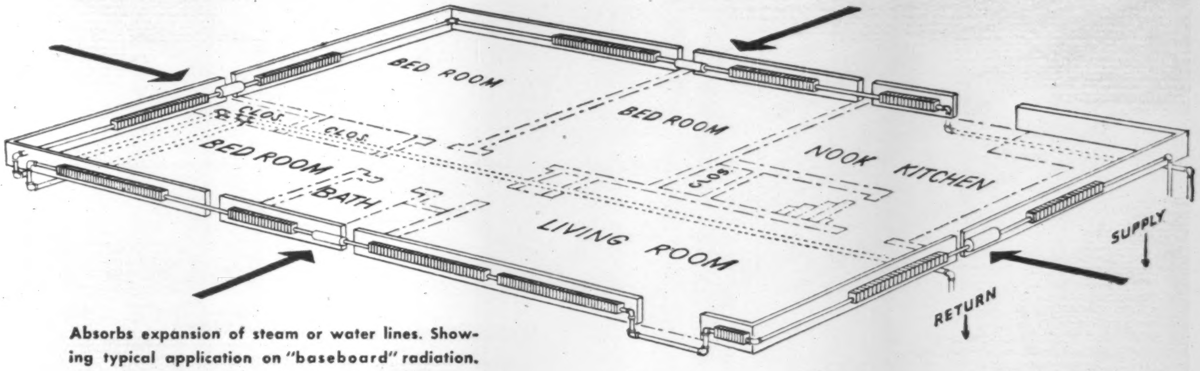
AMERICAN-Standard
HEATING-COOLING SYSTEMS

American Radiator & Standard Sanitary Corporation, Dept. HP-54, Pittsburgh 30, Pa.

Serving home and industry: AMERICAN-STANDARD • AMERICAN BLOWER • CHURCH SEATS & WALL TILE • DETROIT CONTROLS • KEWANEE BOILERS • ROSS EXCHANGERS • SUNBEAM AIR CONDITIONERS

SYLPHON PACKLESS EXPANSION JOINT No. 96066


REMOVE AFTER INSTALLATION
TWO-PLY SEAMLESS SYLPHON BELLOWS
SHIELD
SILVER BRAZED


BED ROOM
BED ROOM
CLOS.
CLOS.
BED ROOM
BATH
NOOK
KITCHEN
LIVING ROOM
SUPPLY
RETURN

Absorbs expansion of steam or water lines. Showing typical application on "baseboard" radiation.

PROVED method for absorbing expansion
in hot water or steam heating lines

CHECK THESE OUTSTANDING FEATURES:

1. **Completely pre-assembled at the factory.**
2. **Minimum number of parts for simplicity of operation.**
3. **Easily installed, vertically or horizontally.**
4. **Sylphon bellows replaces packing — prevents leakage.**
5. **Corrosion-and-rust-resistant.**
6. **Small, compact, sturdy.**
7. **Built to serve for years—maintenance-free.**
8. **Can be easily removed from the lines.**
9. **Low cost.**

● Proved in numerous installations, this Sylphon Packless Expansion Joint No. 96066 provides an efficient, economical solution to thermal expansion problems in piping used in heating systems. It controls expansion of hot water or steam lines feeding wall, fin or "baseboard" radiation or similar long-run heating surfaces.

Sylphon Packless Expansion Joint No. 96066 is ideal for use in any type of building or home where expansion in heating system piping must be controlled. Send for complete information, sizes, pressure limits, etc. Write for Catalog JH-E.

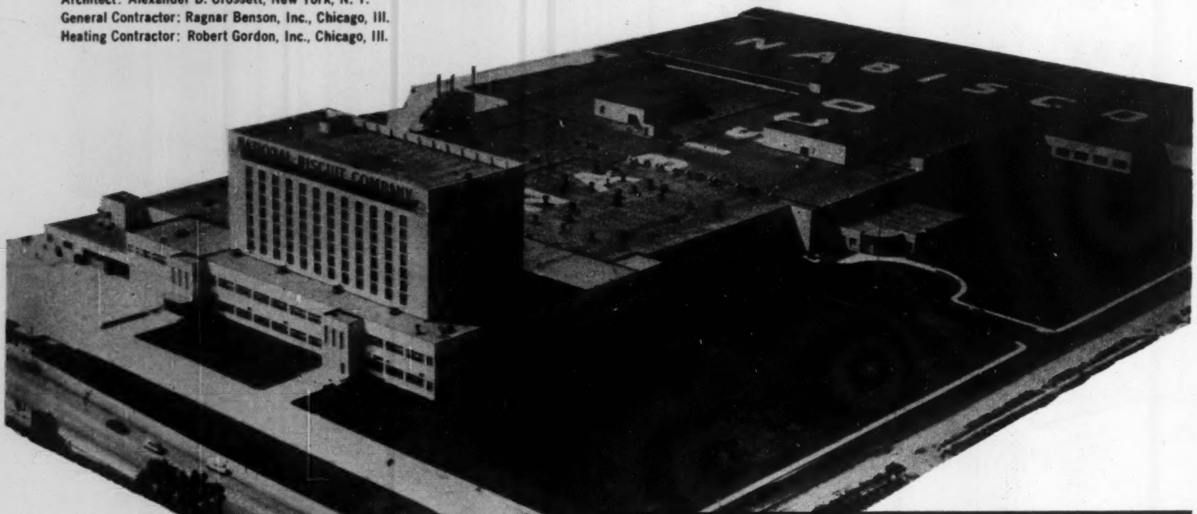
FULTON SYLPHON
50th
ANNIVERSARY
1904·1954

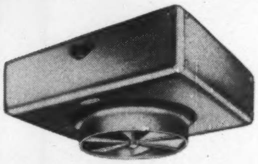
Robertshaw-Fulton
CONTROLS COMPANY

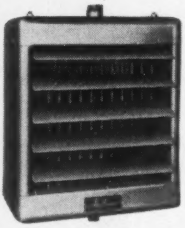
FULTON SYLPHON DIVISION • KNOXVILLE 1, TENN.

National Biscuit Company
Chicago, Illinois

Architect: Alexander D. Crossett, New York, N. Y.
General Contractor: Ragnar Benson, Inc., Chicago, Ill.
Heating Contractor: Robert Gordon, Inc., Chicago, Ill.







90 VERTICAL DISCHARGE HEATERS INSTALLED from 102,500 BTU to 185,000 BTU

92 HORIZONTAL DISCHARGE HEATERS INSTALLED from 14,800 BTU to 250,000 BTU

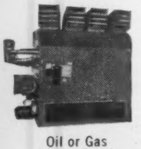
Airtherm
STEAM UNIT HEATERS

WARM THE WORLD'S LARGEST BAKERY

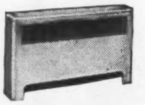
To achieve flexible, economical heating throughout Nabisco's new $20 million Chicago plant, 182 Airtherm steam unit heaters have been installed. The plant is the world's largest cracker and biscuit bakery with ovens the length of football fields, almost 20 acres of floor space and a capacity of 167 million pounds yearly.

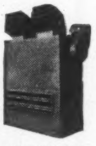
When the area to be heated presents unusual problems, chances are you can solve them easily and economically with the flexibility of Airtherm unit heaters.

For Heating Satisfaction . . .
Think First of
Airtherm


Oil or Gas Direct Fired Heaters

Gas Fired Unit Heaters


Convectors


Centrifugal Fan Unit Heaters

See Your Wholesaler, or Write

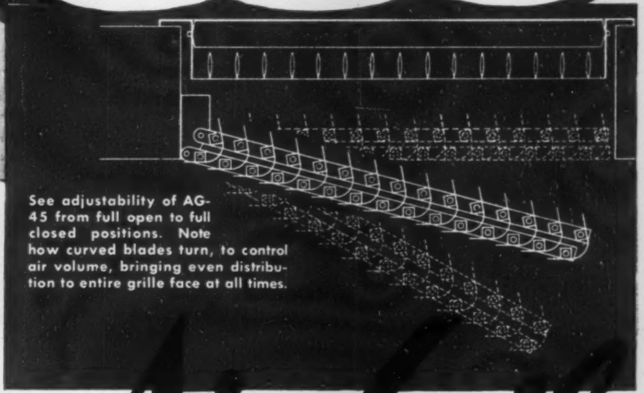
AIRTHERM MANUFACTURING COMPANY
711 S. Spring Ave., St. Louis 10, Mo.

AT-150

NEW
ADJUSTABLE
DOUBLE DUTY

AIR VOLUME EXTRACTOR & CONTROLLER

FACTORY ASSEMBLY SAVES UP TO 50% OVER SLOW HAND-MADE METHODS



See adjustability of AG-45 from full open to full closed positions. Note how curved blades turn, to control air volume, bringing even distribution to entire grille face at all times.

11 TREMENDOUS ADVANTAGES:

1 FACTORY ASSEMBLED
2 INSTALLS WITH 2 SCREWS
3 Double Duty Extractor & Vol. Controller
4 Replaces Extra Vol. Controller
5 Equalizes Air Distribution & Air Flow
6 Turns Air from Main Duct
7 Reduces Pressure Losses
8 Stops Excess Turbulence
9 Low Cost
10 Rattle Free
11 14 & 20 Gauge Steel

Airfoil
AIR CONDITIONING OUTLETS

Slash unit costs with this amazing new Titus AG-45. Make it easy for yourself to *keep bids low.* Use this *cost saver* to beat competition. Eliminate the extra work of putting in volume controllers. Save time, labor. IMPROVE THE AIR CONTROL EFFICIENCY OF EVERY INSTALLATION. Get complete free information now. Order a sample AG-45 today. Remember, not until you have one of these AG-45s in your hand, can you see its *amazing cost-saving value.* IMMEDIATE DELIVERY.

Free

Check Type of Grille on Which Information Is Desired:

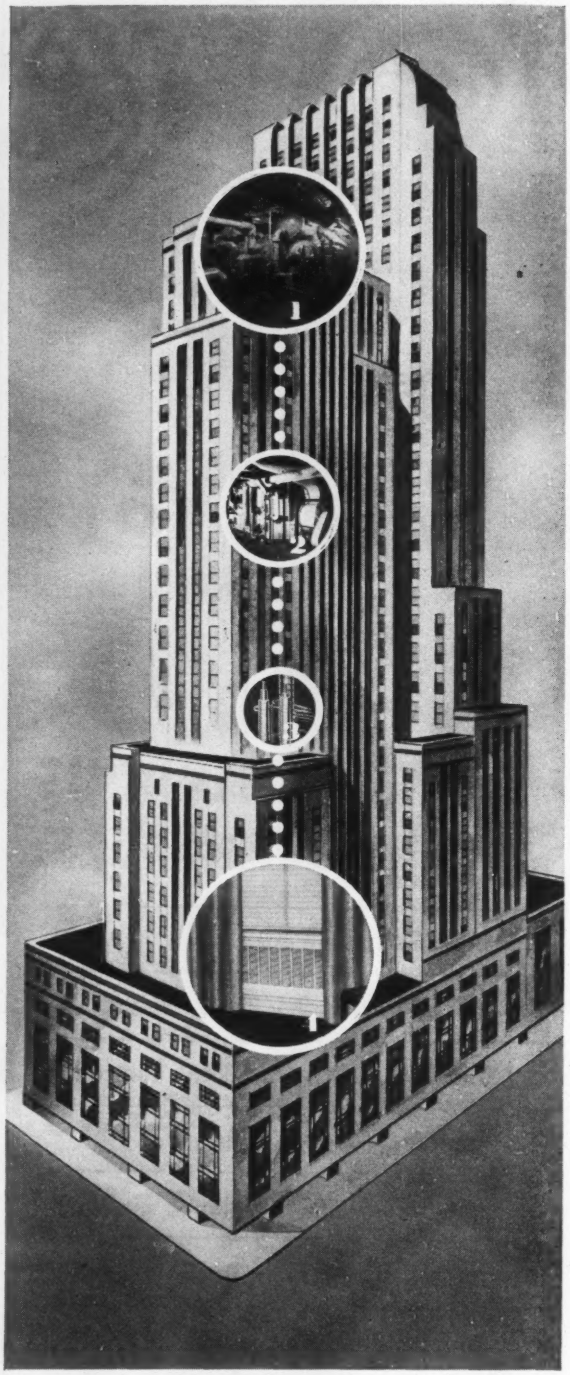
☐ Air conditioning outlets
☐ Return air grilles and registers
☐ Volume controllers
☐ Perforated metal and ornamental grilles
☐ Industrial grilles
☐ Special made-to-order grilles.

TITUS MANUFACTURING CORP., WATERLOO, IOWA

☐ RUSH information on AG-45 Extractor & Controller
☐ Send complete catalog
☐ Send literature on above checked items

NAME ____________________
ADDRESS ____________________
CITY ____________________ STATE ______

Here's why more and more of America's famed buildings are installing the Yorkaire system of air conditioning



The YORKAIRE SYSTEM brings new standards of comfort to the modern miracle of air conditioning, yet see how simple it is, how easy to understand! . . .

1. Source of comfort cooling is the famous and rugged York Turbo Water Cooling System which may be located on the roof of the building or in the basement.

2. Great volumes of air are brought into the building from outdoors at convenient points. This "raw" air is filtered, washed, cooled or heated, and conditioned for the right amount of moisture. When it's "just right for comfort," it begins its swift, silent journey to you.

3. Through small, space-saving, tightly sealed tubes the conditioned air is sent under mild pressure, branching out at each floor to the individual rooms. At the same time, small pipes carry hot water in winter and cold in summer to help you obtain the temperature you want.

4. In room units under the windows the air tube and water pipes converge. These units distribute the conditioned air in a gentle, quiet stream. A simple control allows you to refine the temperature to the conditions you desire, with no mixture of air from other rooms.

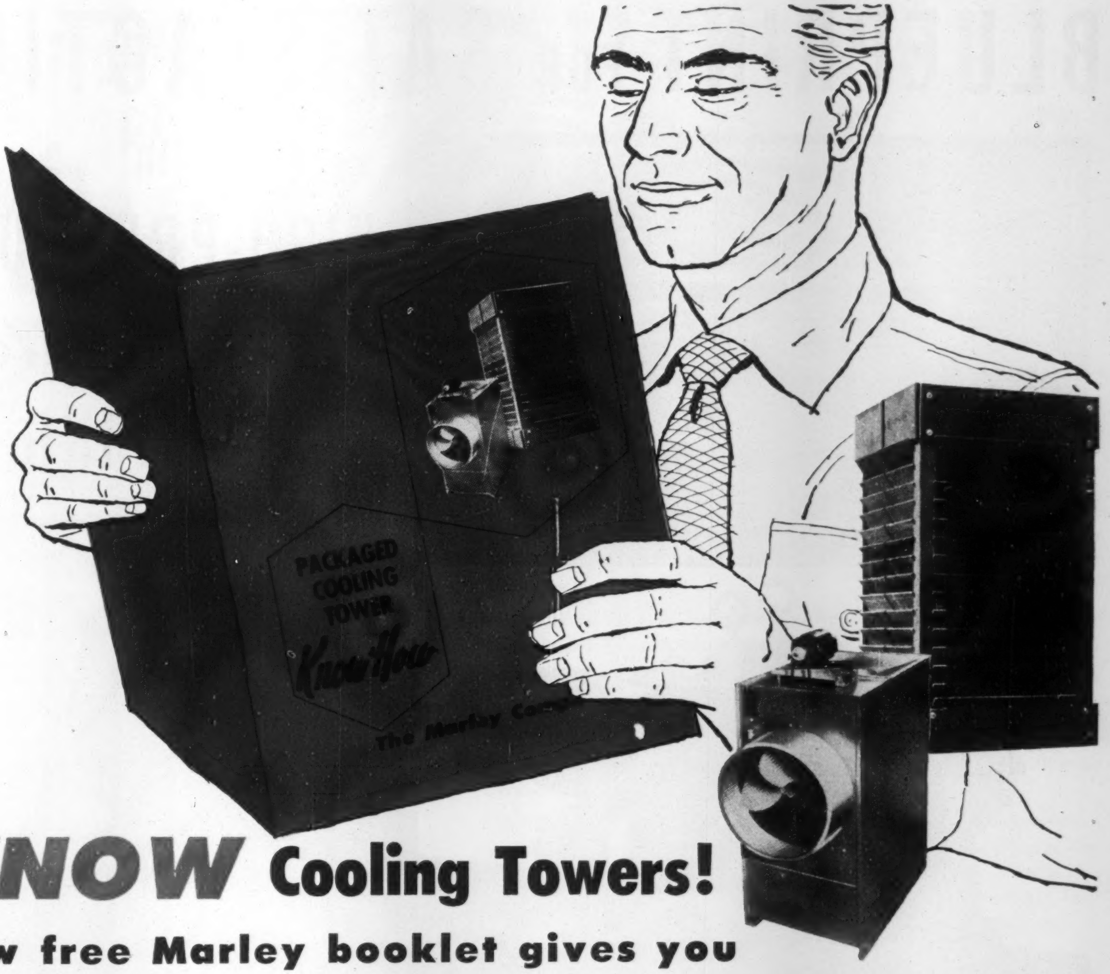
YORKAIRE SYSTEMS of Air Conditioning are being installed in building after building, old and new, across the country.

air conditioning by york

. . . Recent contracts include these famous buildings—Mile High Center, Denver; Netherland-Plaza Hotel, Cincinnati; Fulton National Bank, Atlanta; Equitable Life Assurance Society, San Francisco; Esso Standard Oil Company, Philadelphia. If you are not now enjoying this healthful comfort, perhaps you will, sooner than you think.

YORK CORPORATION York **YORK, PA.**

HEADQUARTERS FOR MECHANICAL COOLING SINCE 1885



KNOW Cooling Towers!

New free Marley booklet gives you all the answers on packaged water cooling towers

Because selection and installation of the proper cooling tower can "make or break" a comfort cooling job, numerous air conditioning dealers and contractors have sought reliable information from the Marley Company, world's leading producer of water cooling towers. Now, in "PACKAGED COOLING TOWER KNOW-HOW", Marley shares its thirty years of specialized experience with all those who have a stake in the booming air conditioning market.

Many manufacturers and distributors of air conditioning are using this new 32-page book as a "training manual" for dealers and service men. It explains the functions of cooling towers . . . describes the workings of various types of towers . . . aids in selecting the proper tower for the job . . . gives advice on tower location, piping, electrical wiring . . . complete installation and maintenance instructions that facilitate erection and operation of cooling towers.

Copies are yours for the asking for a limited time.

MAIL THE COUPON TODAY!

THE MARLEY COMPANY
204 W. Gregory Blvd., Kansas City, Missouri

Please send me a copy of your new book, "Packaged Cooling Tower Know-How."

Name..

Firm..

Address..

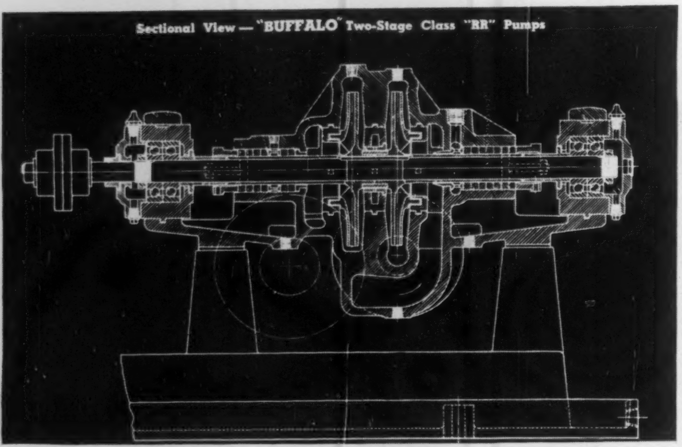
City.. State..

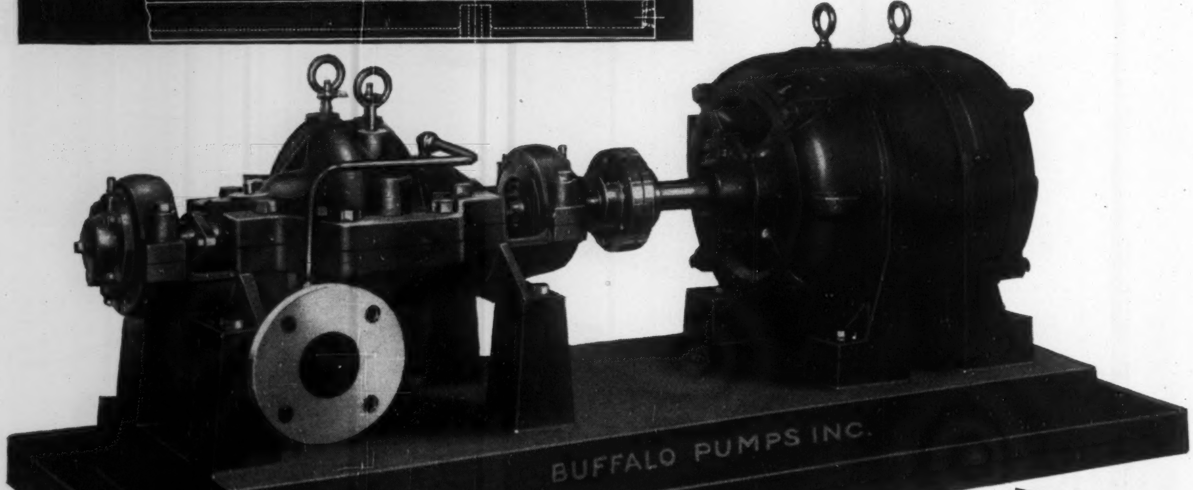
MARLEY ®

The Marley Company

Kansas City, Missouri

BLUEPRINT FOR SATISFACTION in HIGH-PRESSURE *Clear Water* PUMPING





"Buffalo"
BUFFALO PUMPS INC.

A look at a sectional drawing of a "Buffalo" 2- or 4-stage Type "RR" Pump will readily show you why this pump is giving complete satisfaction. Full ball bearing support on each end of the oversize shaft gives the pump strength where it counts. The husky, enclosed impellers mean lastingly high efficiency. The deep stuffing boxes (large enough for 7 rings of packing in the 2-stage model illustrated) keep maintenance to a minimum. Passageways in the casing are formed to give a "path of least resistance", and the casing is horizontally split for easy rotor inspection.

And every "Buffalo" Pump *has* to prove itself before it ever leaves the factory . . . in a thorough load test. You *know* it will do your job . . . and keep on doing it . . . to satisfaction. Write for Bulletin 980-C today!

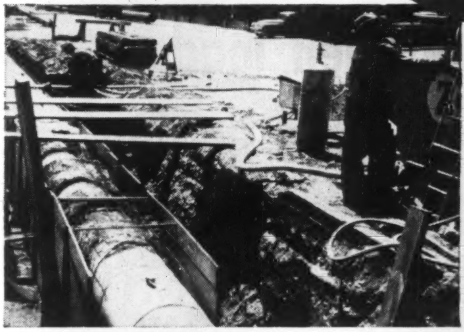
Write for Bulletin 980-C Today

"Buffalo" PUMPS

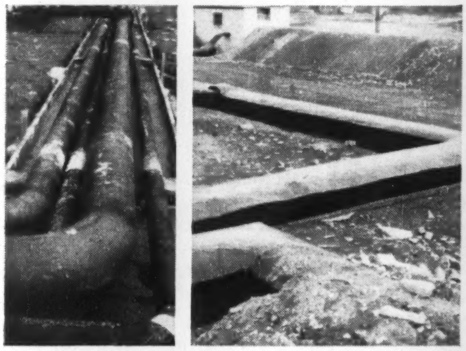
BUFFALO PUMPS, INC.
171 MORTIMER ST. BUFFALO, N.Y.
Subsidiary of Buffalo Forge Company
Canada Pumps, Ltd., Kitchener, Ont. Sales Representatives in all Principal Cities

A BETTER CENTRIFUGAL PUMP FOR EVERY LIQUID

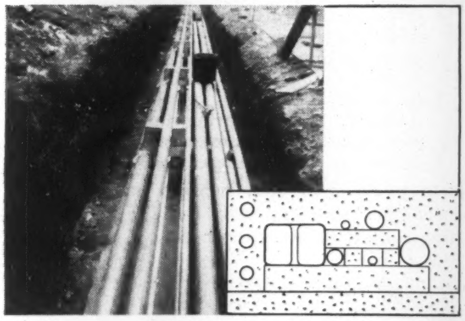
EVEN TOUGH JOBS ARE EASY for "Z-crete"®



No pipe too small or too large to be insulated with Z-crete. Here in city streets a large utility installs a monstrous 30″ low pressure steam supply and 10″ return pipe. Both pipes are contained in a single Z-crete conduit.



A large tank farm pipe assembly insulated with Z-crete on grade. Some of the large Z-crete conduits are used as walkways. On several occasions area has been flooded with no harmful effect on permanent, efficient Z-crete.



In this large hospital area Z-crete effectively insulates the complicated piping system between all buildings. Special support block shapes can be manufactured to meet special needs. Z-crete conduit is in effect a supporting pipe sleeve.

these actual photographs show how Z-crete is solving the toughest job problems

What other insulation for underground piping offers all these superior advantages

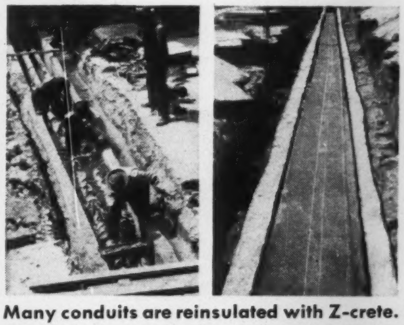
★ **MORE ADAPTABLE**—Z-crete is a field fabrication. Piping contractor has an easy-to-work-on concrete base pad for installing pipe. Pipes are installed—*then* insulated.

★ **MORE ECONOMICAL**—Low in cost, provides permanent and stable insulation. Especially economical in large-pipe or multiple-pipe installations.

★ **MORE EFFICIENT**—Z-crete's monolithic pour eliminates heat loss due to air movement. Six inches of insulation around pipe provides PLUS insulation value.

★ **PERMANENT**—Will not rot or deteriorate...water can't flow through Z-crete. Resilient, completely fire-proof.

★ **READILY AVAILABLE**—Z-crete materials are readily available from our many strategically located plants throughout the United States and Canada. Z-Crete is furnished and installed only by licensed applicators of Zonolite Company under U.S. Patent No. 2355966—Canadian Patent No. 439356. There is an applicator near you.



Many conduits are reinsulated with Z-crete. On this job water had ruined sectional pipe covering insulation. Pictures show before and after reinsulation. (Special pump equipment makes possible reinsulation with minimum of excavation.) It is economical to reinsulate in this manner if piping is good but insulation has deteriorated.

"Z-crete"

DIVISION
Zonolite Company

Write for FREE Booklet

Zonolite Company, Dept. HPA-54
135 S. LaSalle St., Chicago 3, Ill.
Please rush free Z-crete Booklet Z-11 with full details about this easier, better insulation of underground heated piping.

Name..

Address..

City..............................*Zone*....*State*............

1930

Ingersoll-Rand
MOTORPUMPS
have been leaders in air conditioning for 24 years

1944

and NOW a new addition to the line!

1954

9-46

Here's the pumping unit every air conditioning contractor or dealer has been looking for — the new addition to the Ingersoll-Rand Motorpump line.

A leader in 1930 with the first Motorpump for air conditioning, the line was re-engineered to produce the model of 1944. Now here are the fruits of more years of research and development . . . the new air conditioning Motorpump of 1954 by Ingersoll-Rand.

Investigate the features of this pump NOW, features that will insure you of the best pump and keep your reputation for installing efficient, trouble-free equipment.

1—Top hydraulic performance — more liquid moved with less power input.
2—Smaller and lighter in weight.
3—Mechanical seals—rotating ceramic against stationary "Teeplelite" seal face.
4—Positive impeller attachment (key and cap screw) — no screwed-on impellers.
5—A sure-fire and easy method of rotating pump by hand on spring start-up after winter shut-down to loosen seal and ring fits.
6—Priced to meet competition.

Get in touch with your nearest Ingersoll-Rand branch office now and start the 1954 air conditioning season off with the best.

CAMERON PUMP DIVISION OF **Ingersoll-Rand**
11 Broadway, New York 4, N. Y.

It's a SNAP to Apply

BALDWIN-HILL INSULATIONS

BALDWIN-HILL

MONO-KOVER

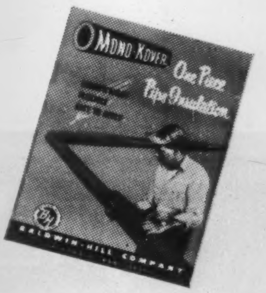
ONE-PIECE PIPE INSULATION

available with Vapor Barrier Jacket

Baldwin-Hill MONO-KOVER is a flexible, featherweight pipe insulation easily applied by spreading at the seam, snapping around pipe and fastening with staples, bands or other fasteners. It is incombustible and moisture resistant — composed of fine mineral wool fibres bonded with phenolic resin and molded in one piece sections.

- Extra Light Density
- Easily Cut and Fitted
- Six Foot Lengths
- Resilient, Flexible
- Won't Break or Crumble
- Easy to Paint
- Highly Efficient
- No Coarse Fibers
- Takes Rough Handling
- Easily Nested
- Non-Corrosive
- Won't Rot, Decay, Mold
- Lower Applied Cost
- Factory Applied Vapor Barrier

Send for MONO-KOVER illustrated bulletin with complete data on how to apply, properties, efficiency, selection help, size and thickness tables.



BALDWIN-HILL COMPANY

1705 BREUNIG AVE. **TRENTON 2, N. J.**

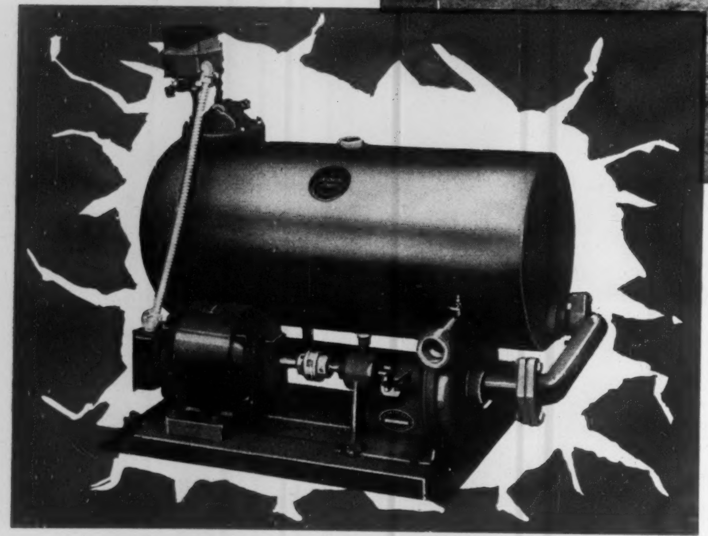
Kalamazoo, Michigan **Huntington, Indiana** **Temple, Texas**

CAUSE FOR ACTION!

PUMPS

NEEDED IN A HURRY...

UNITED STATES AIR FORCE



See Bulletin 14-A for full description of this outstanding Skidmore Pump.

AIR FORCE RUSHES SHIPMENT TO BASE

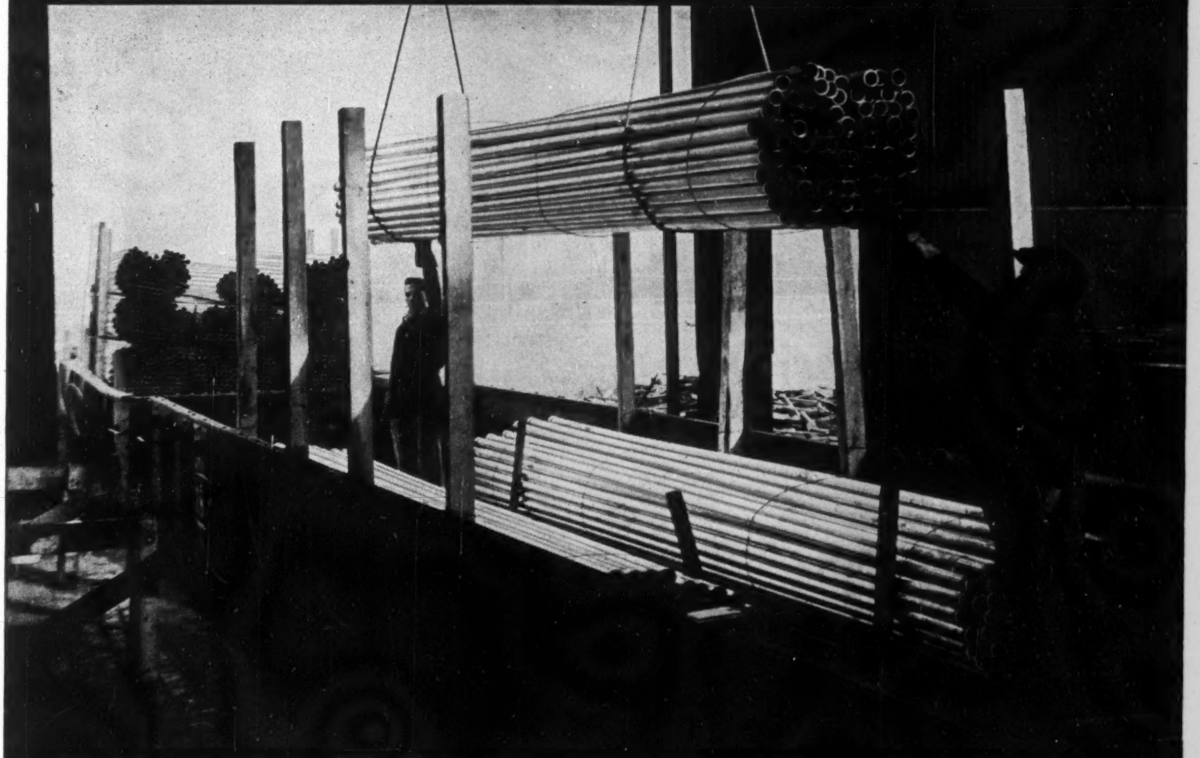
ABOVE: Two-motor cargo plane lands at local air field to pick-up rush shipment of ten Skidmore "HS" boiler feed pumps, needed at once, by east coast air base.

Here again, "proven performance" was the answer . . . when the Army needed a dependable, low cost pump in a hurry — they specified the Skidmore Type "HS" Pump. Yes, the Army knew from past experience what they were getting — and how soon. Take the *guess work* out of your pump program . . . specify a dependable Skidmore Pump on your next installation.

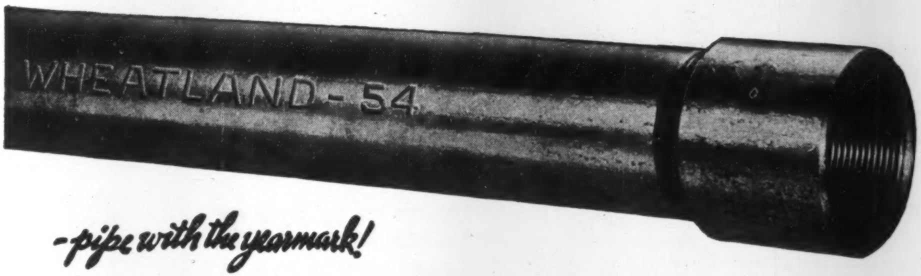
SKIDMORE PUMPS

SKIDMORE CORPORATION • St. Joseph, Michigan

PROMPT DELIVERY



WHEATLAND

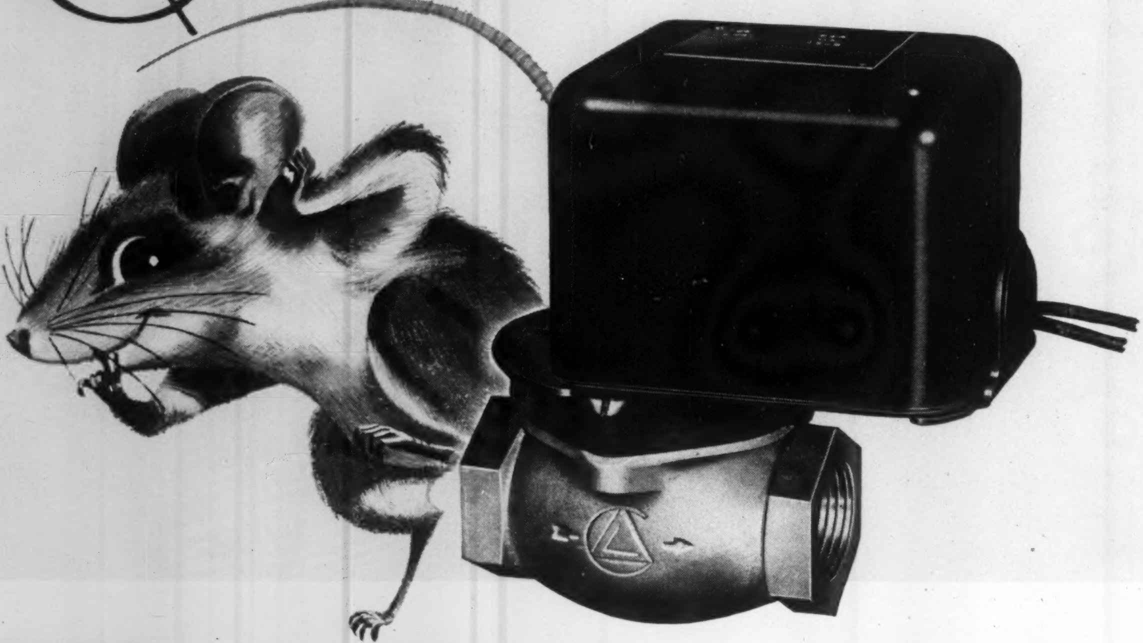


-pipe with the yearmark!

WHEATLAND TUBE CO. BANKERS SECURITIES BLDG., PHILA. 7, PA.

STEEL PIPE

Quiet AS A MOUSE!



DETROIT V-579 "BI-FLEX"

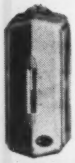
The Quiet-Acting GAS VALVE—Performance Proven for Reliable Service on Thousands of Installations!

Check These Features

- Quiet operation—no click, no hum
- Rugged, compact—easy to service
- Inexpensive
- For all gases in all localities
- "Bi-flex" motor operated—low voltage
- Compensated for changes in ambient temperature
- Snap-acting opening and positive closing
- ½-inch to 1¼-inch sizes

Here is a gas valve which is actually quiet in operation! Its strong "Bi-flex" motor provides unfaltering opening and tight shut-off closing with absolutely no annoying, worrisome bangs, clicks or hums. Thousands of installations have proved its unsurpassed reliable, trouble-free performance. Simple in design, positive in operation, the V-579 operates independently of gas pressure and is available in sizes to fit any domestic heating system. Write today for Bulletin No. 229.

NO. 411—*the sensitive and accurate Timed Cycling Thermostat for all types of heating systems. Provides close control of room temperature. Attractively styled, easily installed and adjusted. Write for Bulletin No. 193 and Form No. 1545-A.*

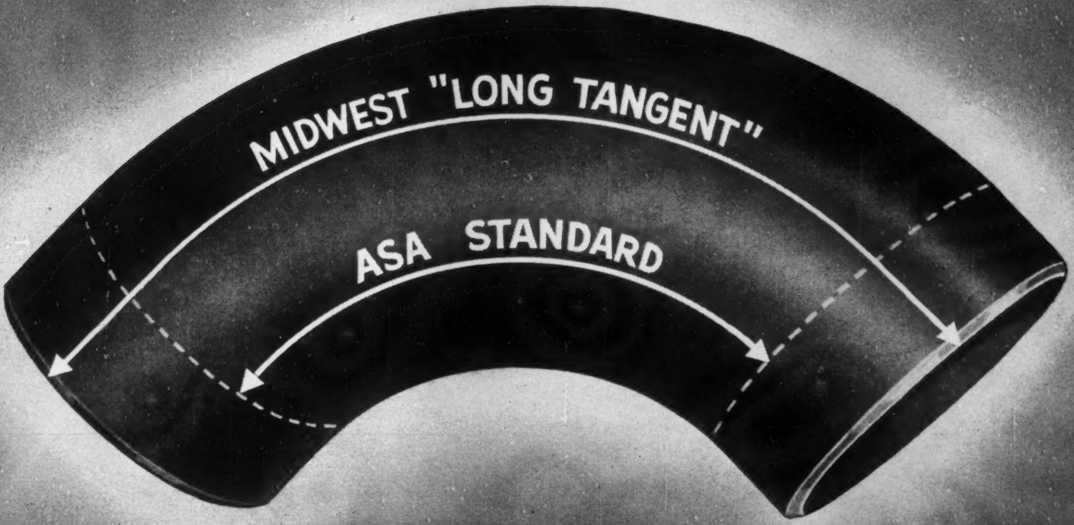


DETROIT CONTROLS Corporation
5900 TRUMBULL • DETROIT 8, MICHIGAN
Division of American Radiator & Standard Sanitary Corporation

Representatives in Principal Cities • Canadian Representatives in Montreal, Toronto, Winnipeg—Railway and Engineering Specialties, Ltd.

AUTOMATIC CONTROLS for REFRIGERATION
AIR CONDITIONING • DOMESTIC HEATING • AVIATION • TRANSPORTATION • HOME APPLIANCES • INDUSTRIAL USES
Serving home and industry
AMERICAN-STANDARD • AMERICAN BLOWER • CHURCH SEATS & WALL TILE • DETROIT CONTROLS • KEWANEE BOILERS • ROSS EXCHANGERS • SUNBEAM AIR CONDITIONERS

When you buy welding elbows . . .



Why take less when you can get more?

. . . (and at the same price)

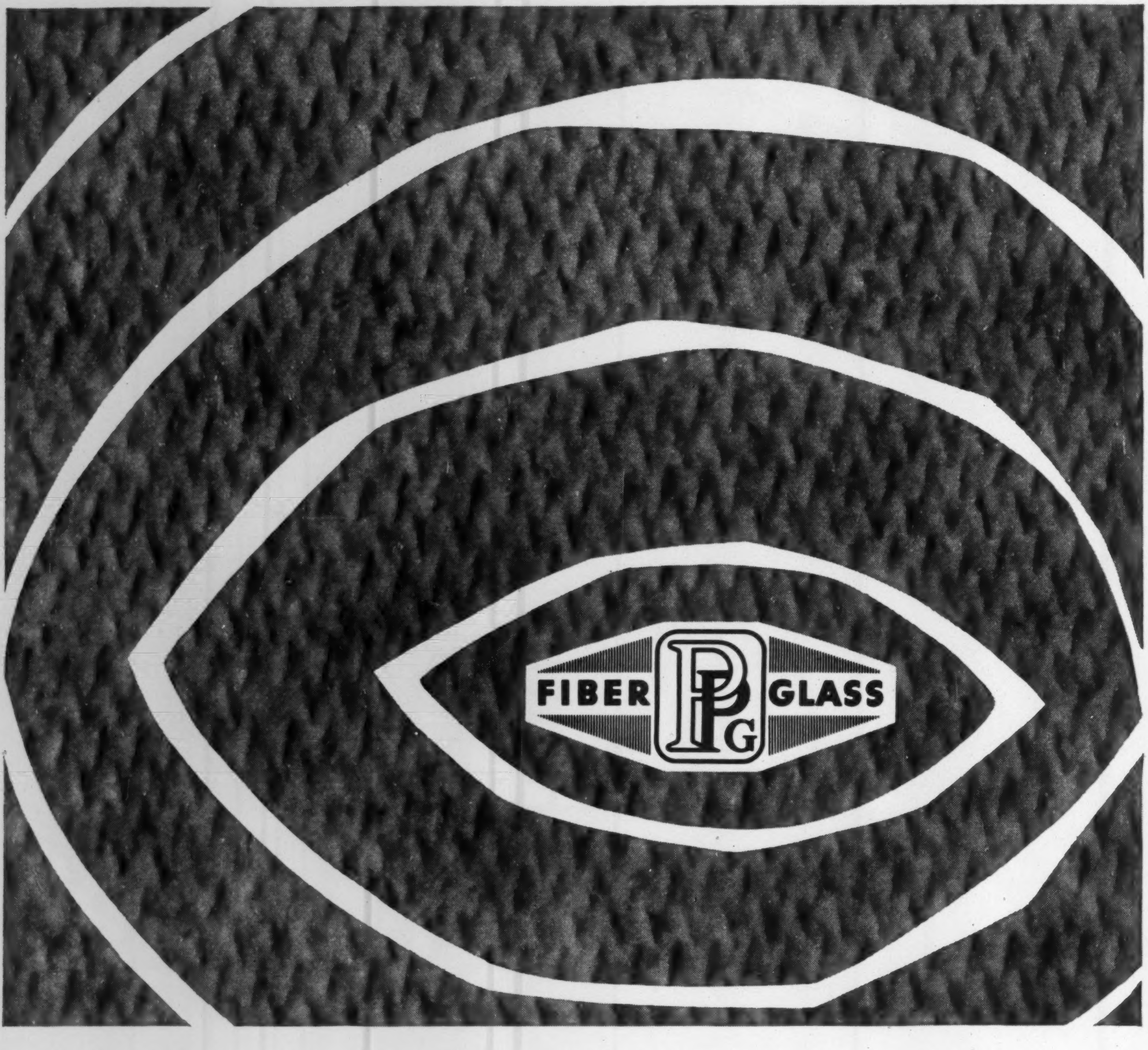
ADVANTAGES OF MIDWEST "LONG TANGENT" ELBOWS

- ★ They save pipe.
- ★ They often eliminate short nipples and their extra welds.
- ★ They save time and money in lining up and clamping pipe and fitting.
- ★ They make it easier to apply slip-on flanges.
- ★ They remove the circumferential weld from point of maximum stress and can be sleeved.
- ★ THEY COST NO MORE THAN OTHER ELBOWS.

As shown in the illustration above, Midwest "Long Tangent" welding Elbows have straight ends equal to ¼ of the nominal fitting diameter (a 12″ elbow has tangents 3″ long). For the reasons listed at the left, substantial savings are made on many piping systems by using Midwest "Long Tangent" Elbows. For more information about them, write for Catalog 54.

MIDWEST PIPING COMPANY, INC.
Main Office: 1450 South Second Street, St. Louis 4, Mo.
Plants: St. Louis, Passaic, Los Angeles and Boston
Sales Offices:
New York 7—50 Church St. • Chicago 3—79 West Monroe St.
Los Angeles 33—520 Anderson St. • Houston 2—1213 Capitol Ave.
Tulsa 3—224 Wright Bldg. • Boston 27—426 First St.
STOCKING DISTRIBUTORS IN PRINCIPAL CITIES 6722

MIDWEST WELDING FITTINGS IMPROVE PIPING DESIGN AND REDUCE COSTS



Pittsburgh Superfine efficiently insulates any shape or form...fast!

Pittsburgh Superfine's high quality insulating characteristics make it ideal for virtually every type of insulating job. It fits into corners neatly and around complex assemblies easily. There is no need for extra cutting or overlapping because Superfine is available in any roll widths from 18″ to 72″ or any slit width down to 2 inches. Since it's so easy to handle and apply, installation labor costs are drastically reduced!

Pittsburgh Superfine not only gives you excellent sound absorption qualities, but also maximum thermal insulation protection for both high or low temperature ductwork. It can be applied with either adhesives, tapes, cord or wire—and is available with or without a variety of aluminum foil, vinyl, or paper facings.

For more information on the superior qualities and cost reducing advantages of Pittsburgh Superfine, why not contact our executive offices or district sales offices in Chicago, Cincinnati, Cleveland, Detroit, New York or Washington. Pittsburgh Plate Glass Company, Fiber Glass Division, One Gateway Center, Pittsburgh 22, Pa.

FIBER PPG GLASS

PAINTS · GLASS · CHEMICALS · BRUSHES · PLASTICS

PITTSBURGH PLATE GLASS COMPANY

NIBCO-2 1/2-S40-WPB
BEEFED . . . NOT BULGED
BRAWNY!

THE NEW NIBCO CARBON STEEL TEE

All NIBCO Welding Tees meet
A. S. A. Specification B16.9-1940

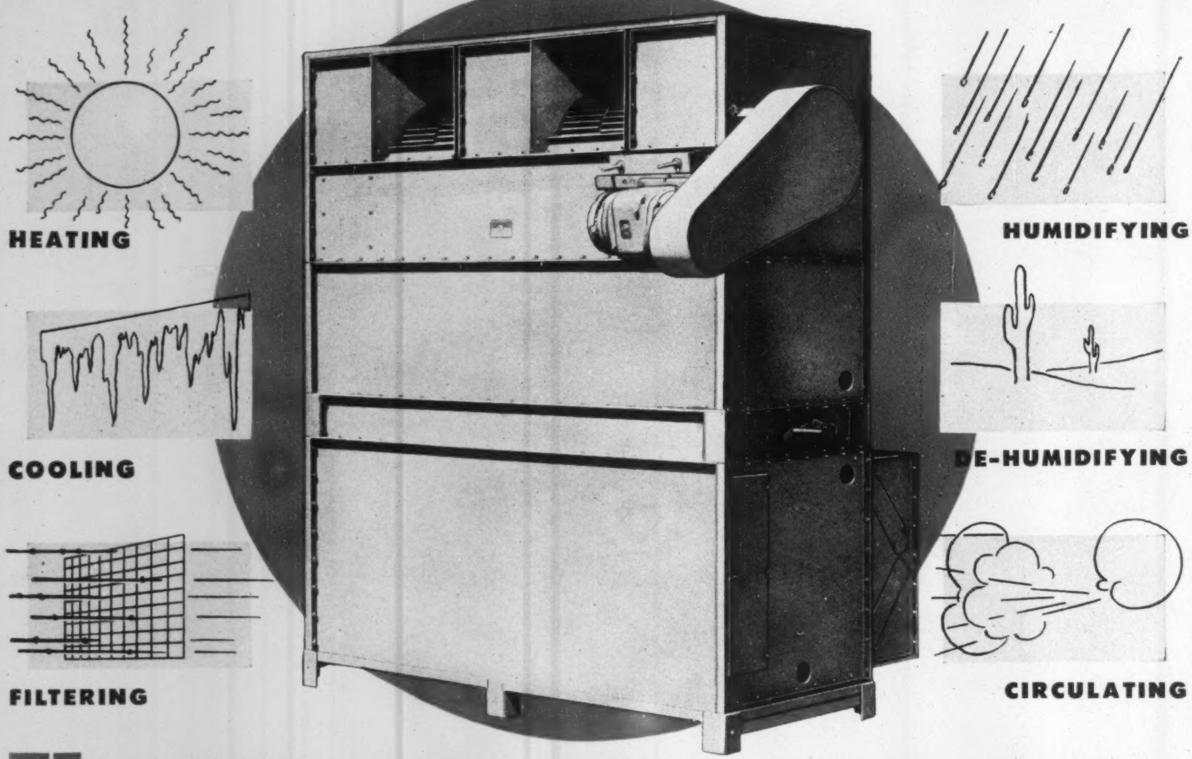
U. S. PATENTS 2,027,285—2,111,695—2,557,403

NIBCO

Controlled cold-flow of metal makes the NIBCO Tee the strongest point in the pipe line. Walls are reinforced with extra metal thickness where extra strength is needed. NIBCO's exclusive forming operation creates a denser grain structure that makes the tee stronger and more resistant to corrosion. Look for the distinctive "Brawny" shape, the smooth unrestricted passages and the beautiful cold-formed finish. They're your clues to superior performance in NIBCO "Brawny" Carbon Steel Welding Tees. You can get them through your regular source of supply.

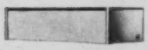
NORTHERN INDIANA BRASS COMPANY, 571 Plum St., Elkhart, Indiana

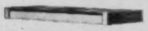
here's COMPLETE flexibility in UNIT AIR CONDITIONERS

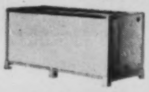


YOUNG SECTIONAL "YAC" UNITS

FAN SECTION—Dynamically balanced multi-blade fan(s). Air discharge direction alterable.


HEATING COIL SECTION—With non-ferrous tube and fin coils available for hot water and steam.


DAMPER SECTION—Furnished with face or face and bypass dampers as required.


BASE & COOLING COIL SECTION—With serpentine or cleanable type water, or direct expansion coils.

FILTER SECTION—Incorporating either throw away or cleanable type filters.

MEET EVERY AIR CONDITIONING REQUIREMENT

Young sectional design air conditioning units enable you to offer year-around comfort. To meet specific requirements, "YAC" units are available in any combination from simple heating or cooling to complete air conditioning, including heating, humidifying, cooling, dehumidifying, filtering and circulating. "YAC" units are built in eight compact sizes, in either horizontal or vertical types, in capacities from 400 to 15,748 cfm. They can be installed either right or left hand. Young sectional design also permits greater ease in handling, installing and servicing. For further details or Catalog, see your nearest Young sales representative listed in the "yellow pages" of your telephone book, or write direct.

YOUNG

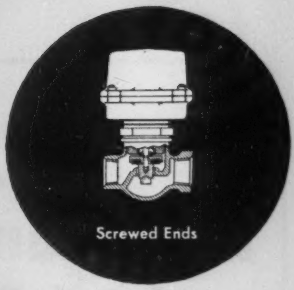
...AN "OLD" NAME IN HEAT TRANSFER ENGINEERING

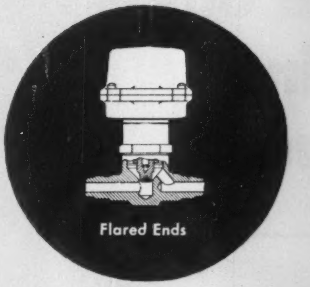
YOUNG RADIATOR COMPANY

Dept. 514-E • Racine, Wisconsin • Factories at Racine, Wisconsin and Mattoon, Illinois
Sales and Engineering Offices in All Principal Cities

POWERS

First with duo-seal PACKLESS CONTROL VALVES


Screwed Ends

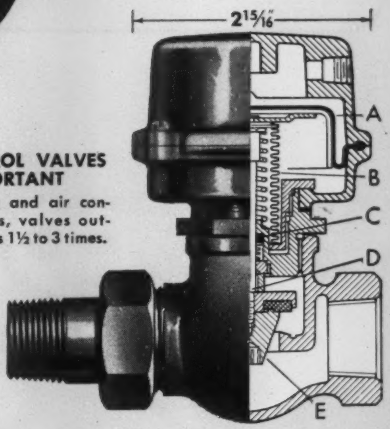

Flared Ends

DURABLE AIRTIGHT CONSTRUCTION

GOOD CONTROL VALVES ARE IMPORTANT

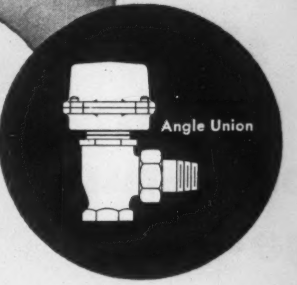
On many heating and air conditioning systems, valves outnumber thermostats 1½ to 3 times.

Available in Various Types and Sizes



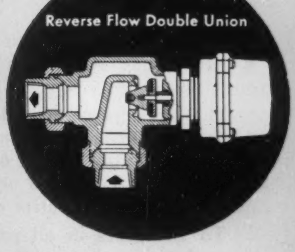
Rugged Cast Aluminum Top

- A) Durable Molded Diaphragm
- B) Bronze Bellows, Primary Seal
- C) "O" Ring, Secondary Seal
- D) Polished Stainless Steel Valve Stem
- E) Characterized Throttling Nut


Angle Union

More ACCURATE Control with Powers PACKLESS Valves

Minimum valve stem friction. No packing nut or gland to be tightened, oiled or adjusted. No binding of valve stem as with conventional packing. Powers **duo-seal construction** assures better performance and—


Reverse Flow Double Union

No Packing Maintenance. No Leakage of Water or Steam. No Loss of Vacuum.

To insure getting a temperature control system with the best control valves made for convectors, unit air conditioners, unit ventilators, radiators, panel heating and cooling coils—specify or install POWERS pneumatic control.

Established in 1891 • THE POWERS REGULATOR COMPANY • SKOKIE, ILL. • Offices in Over 50 Cities

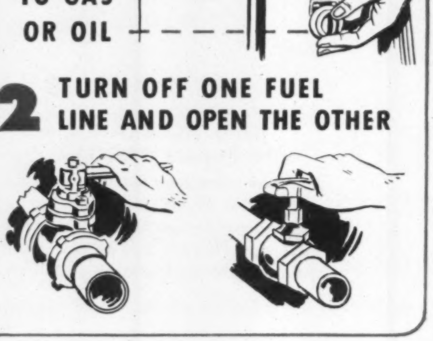
(b72)

NOW... interchange Gas and Oil firing in *10 seconds*

Modern Cleaver-Brooks
Model LR Steam Boiler
Equipped with Exclusive
Cleaver-Brooks "10-second
conversion" Combination
GAS and/or OIL Burner

1 TURN SELECTOR SWITCH TO GAS OR OIL

2 TURN OFF ONE FUEL LINE AND OPEN THE OTHER



TWO, simple motions eliminate time-consuming change-over

Now you can use oil or gas at the flick of a switch! This exclusive new Cleaver-Brooks development permits changeover from oil to gas or vice versa in only 10 seconds.

That's because the Cleaver-Brooks Combination Gas and/or Oil Fired Boiler operates on gas *with the oil burner in place.* Simply flipping a selector switch on the control panel to either gas *or* oil sets the proper circuit in action. Turning the convenient fuel supply valves completes the entire changeover — and in 10 seconds or less!

To gas users in all parts of the country — and in particular areas where local requirements demand immediate changeover — this exceptional fuel flexibility can be an important factor in determining your overall operating economy.

Ten-second conversion, like 4-pass construction, self-contained design, guaranteed 80% efficiency when firing with oil, is another "plus" feature pioneered by Cleaver-Brooks. It demonstrates Cleaver-Brooks' continuing effort to bring steam users even greater flexibility and reduced operating costs.

If you are considering simplifying your present boiler plant, remember Cleaver-Brooks Combination GAS and/or OIL Fired Boilers. Sizes 15 to 500 h.p. — 15 to 250 p.s.i. Write for complete facts.

Cleaver-Brooks

**Originators of the
Self-Contained Steam Boiler**

CLEAVER-BROOKS COMPANY
Dept. F-312 E. Keefe Ave., Milwaukee 12, Wis., U.S.A.
Cable Address: Clebro-Milwaukeewis
Builders of Equipment for the Generation and Utilization of Heat • Steam Boilers • Oil and Bitumen Tank-Car Heaters • Distillation Equipment • Oil and Gas-Fired Conversion Burners

GOT A TOUGH CORROSION PROBLEM?

..........*Relax!*

Light up your pipe and lean way back in your favorite chair. If you're troubled with a tough corrosion problem—why not let our metallurgical staff do the worrying for you.

Whether you're in need of intricate stainless castings or top quality stainless steel valves, fittings or accessories, just turn the specifications over to Cooper Alloy. Our products are produced with care—use them with confidence and relax.

COOPER ALLOY

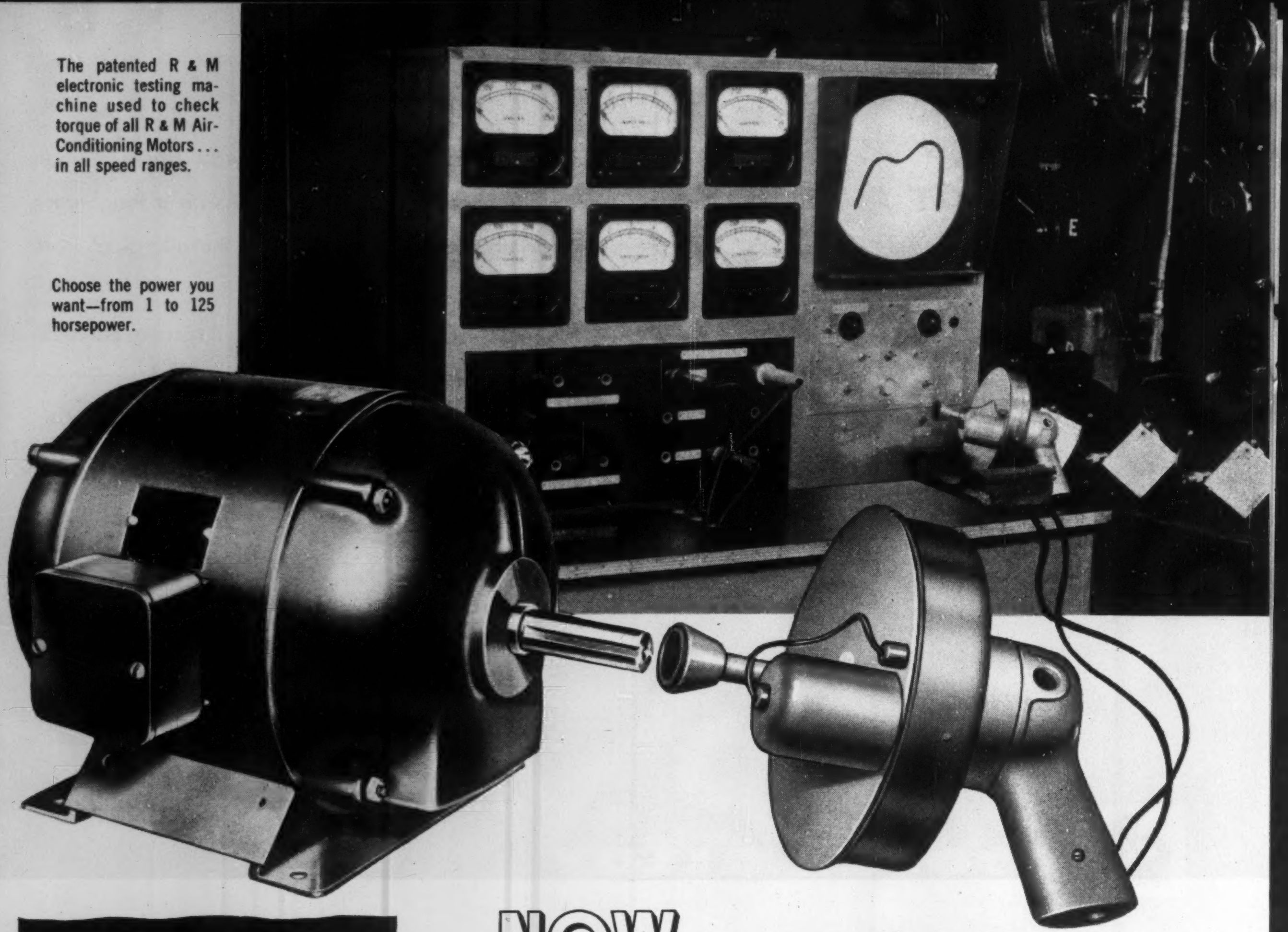
THE COOPER ALLOY FOUNDRY CO. • HILLSIDE, N. J.

Los Angeles, San Francisco, Oakland, Houston, Chicago, Detroit, Philadelphia, Hartford

Leading producers of STAINLESS STEEL valves, fittings and castings

The patented R & M electronic testing machine used to check torque of all R & M Air-Conditioning Motors . . . in all speed ranges.

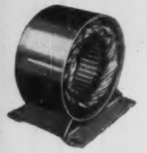
Choose the power you want—from 1 to 125 horsepower.

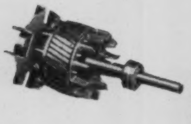


NOW . . . get the torque YOU want . . . by specifying ROBBINS & MYERS!

"Weatherized" inside and out— AT NO EXTRA COST!

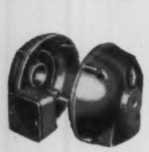
Steel parts undercoated with baked-on "Robbinite."

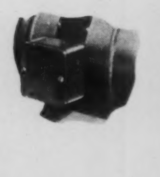




Rotor and shaft assembly sprayed with special rust inhibitor.

Cast-iron parts get special anti-corrosion treatment.





Terminal box—cast-iron—gasketed; leads sealed. Repellent grease keeps moisture out of bearings.

R & M motors have not only the right construction features for air-conditioning service, but the right *torque characteristics* as well.

That's because we have completely eliminated guesswork in determining the starting and acceleration performance of our induction motors. Tested by a unique electronic machine over the entire speed range, each motor *shows* its own *complete* accelerating curve, including that part which is almost impossible to obtain by other methods.

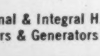
For you, this means your R & M motor will not "hang up" at some low speed—the "dips" have been designed out. And this patented speed-torque tester proves it!

And, here's something you'll want to know about *installation*. You can reconnect—*on the job*—all R & M standard 220/440 volt motors for 220 volt part-winding increment starting. Thus, only half normal starting current is drawn—without need for autotransformers or resistors.

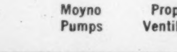
Want more details? Write for Bulletin 400HP, showing all the advanced construction features of R & M motors. It costs you nothing, of course, to find out about the finest air-conditioning motor your money can buy!

ROBBINS & MYERS, INC.

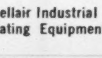
MOTOR DIVISION · SPRINGFIELD, OHIO · BRANTFORD, ONTARIO



Fractional & Integral H.P. Motors & Generators

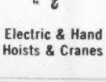


Moyno Pumps



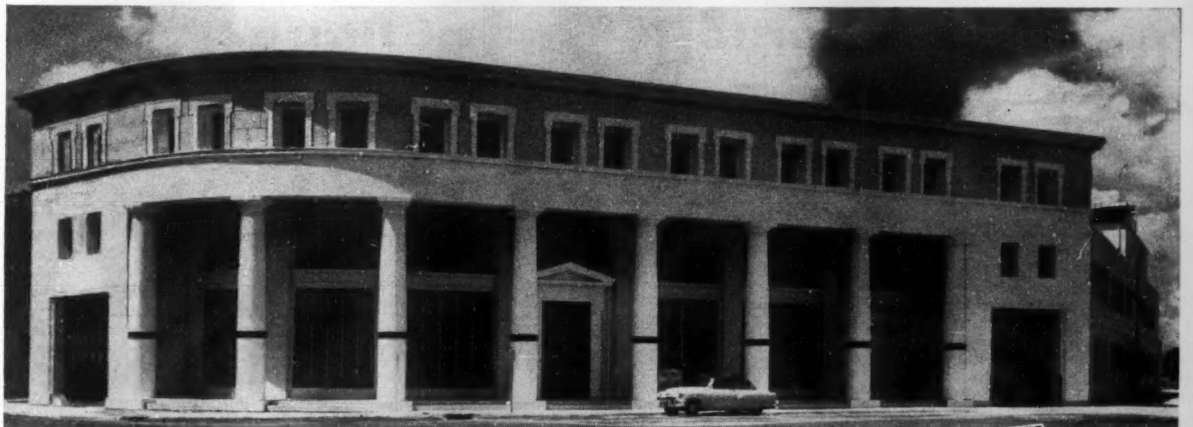
Propellair Industrial Ventilating Equipment

Electric Fans

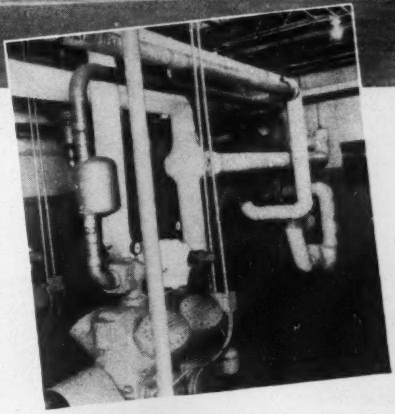


Electric & Hand Hoists & Cranes

Acme furnished the package for RYAN BUILDING 100-TON COOLING SYSTEM



CONTRACTOR — Art Calvert Sales & Service
CONSULTING ENGINEER — R. L. Duffer



When the Florida Power & Light Company decided to air condition its Ryan Building offices in Miami, Florida they took the easy way of installing a system by using an Acme Flow-Therm Packaged Water Chiller. This unit consisting of a two-circuit Acme Dry-Ex, two Acme HX Heat Exchangers, and two Acme STF Condensers furnishes 300 GPM of 46° water to the system. It is used in conjunction with two 50 HP Carrier Compressors.

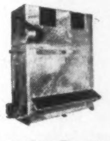
Buying a "package" gave the company a perfectly balanced unit, greatly reduced their installation time and expense, saved space, and, being an Acme Flow-Therm, enabled them to select a packaged unit specifically tailored to their job requirements.

The Flow-Therm is the latest addition to the Acme line of air conditioning and refrigeration products. It is the answer to the contractor and user who wants the benefits of a packaged unit along with the chance to specify matching Acme components. It can be used with any model or make compressor. See your Acme representative for more information on the Flexible Flow-Therm.

ACME INDUSTRIES, INC.

Mfgs. of a complete line of Air Conditioning and Refrigeration Equipment

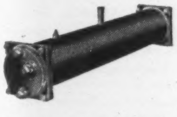
JACKSON, MICHIGAN



Evaporative Condensers
Cooling Towers
Floor-type Unit Coolers

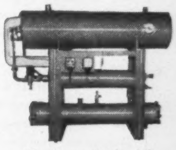
Direct Expansion (Dry-Ex) and Flooded Liquid Chillers

Heat Exchangers, Oil Separators

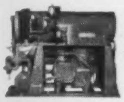


Shell and Tube, Shell and Coil Condensers

Receivers, Pipe Coils



Packaged Liquid Chillers to 225 tons

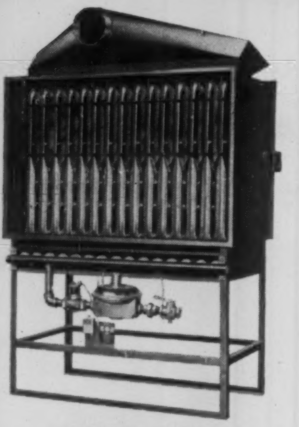


Flow-Temp Heat Pumps

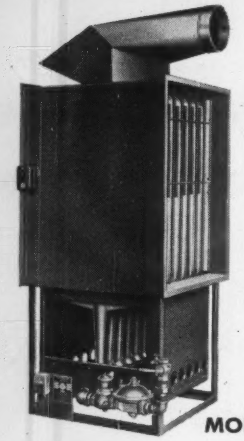
Flow-Cold Liquid Chillers

Remote Room Conditioner

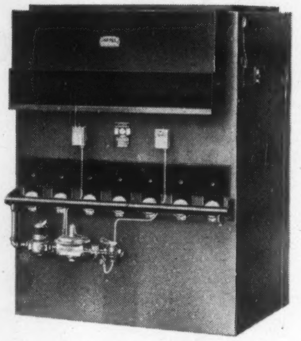
Continuously serving the air conditioning and refrigeration industry since 1919



MODEL SED-E



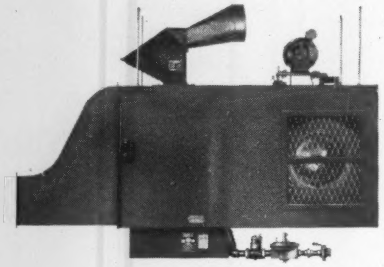
MODEL SED-S



MODEL SED-VF

MODEL SED-E — Non-corrosive type 321 stainless steel heat exchanger. Permits installation downstream of cooling equipment, for continuous blower operation. Air throughput in either direction. 80,000 to 600,000 Btu input.

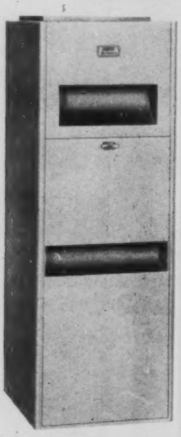
MODEL SED-S — Same as SED-E except controls are at the side, instead of at the end where accessibility requires either SED-E or SED-S is available in sizes from 80,000 to 600,000 Btu input in increments of 40,000 Btu.



MODEL SEU

MODEL SED-VF — Tested and approved as a duct furnace; type 321 stainless steel. Re-circulated or fresh air enters through bottom, sides, or back. Built in air bypass, vent in front. Sizes from 70,000 to 245,000 Btu input.

MODEL SEU — Suspended unit heater. Recirculates room air. Diffuser outlet with adjustable vertical and horizontal vanes. Double inlet forward curve blower. Continuous duty variable pitch drives, raised port burners.



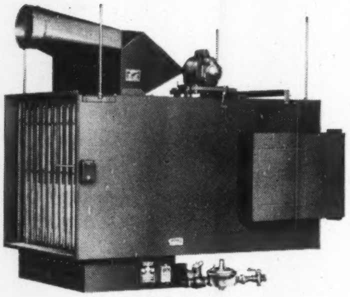
MODEL SEC

HAYES

FURNACES

outstanding for commercial, industrial, schools, churches, theaters, large residential

HAYES FURNACE MFG. & SUPPLY CO.
2929 So. Fairfax Ave., Los Angeles 16, California
Telephone TExas 0-3734



MODEL SES

MODEL SEC — Forced air furnace. Stainless steel heat exchanger sections seam and arc welded. One piece cast iron burners with driller ports. Oversize double inlet blower glass or washable filters. 6 sizes — 70,000 to 245,000 Btu input.

REPRESENTATIVES

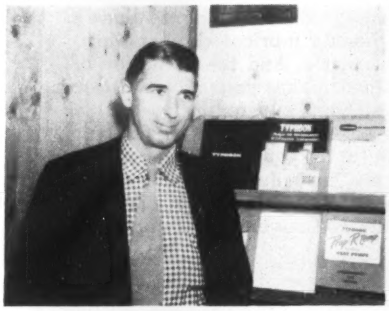
M. Blazer & Son, Passaic, New Jersey.
Blue Flame Supply Company, Atlanta, Georgia.
Eugene Bolstad, Edmonton, Alberta, Canada.
E. B. Bomar, Phoenix, Arizona.
Boyd Engineering Co., Albuquerque, New Mexico And El Paso, Texas.
Reube O. Emery, Nashville, Tennessee.
Hinkle Supply Company, Birmingham, Alabama.
Leudecke Engineering Co. Austin Texas.
McCombs Supply Co., Denver, Colorado.
R. E. Meyers & Associates, New Orleans, Louisiana.
J. M. O'Connor Co., Wichita, Kansas.
O'Connor-Oklahoma Co., Oklahoma City and Tulsa, Oklahoma.
Smith Steam Specialty Co., Kansas City, Mo.
Tay-Holbrook, Inc., San Francisco, California.
F. R. Young, Houston, Texas.

MODEL SES—Forced air, suspended furnace for installation in suspended duct system. Inlet and outlet designed for sheet metal duct connection. Double inlet forward curved blower. Continuous duty variable pitch drives, raised port burners.

"TYPHOON?

They're the most cooperative outfit in the business!"

That's What Any Typhoon Dealer Will Tell You



"Factory-prepared literature opens up leads for me."

—Dan McKenzie, Biscayne Air Conditioning Co., Miami

"Complete Typhoon line gives every one of my prospects the perfect setup for his needs."

—Clyde L. Copp (left), Typhoon dealer in Tulsa, shown with satisfied customer, Perry Ward, restaurant manager

"My Typhoon District Manager helps me figure complex jobs competitively and profitably."

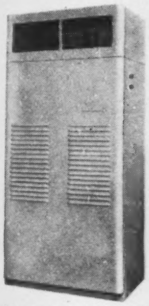
—Don Kissell (left), Los Angeles dealer, shown with Art Krell, Typhoon West Coast District Manager

"Trouble-free performance of rugged Typhoon units chalks up satisfied customers for me."

—Ernest W. Farr, Bell Refrigeration Corp., Cleveland

"A phone call to Typhoon and factory engineers iron out tough technical problems for me in jig time."

—Carl Muno, McCarty Bros. Equipment Corp., Chicago



Air Conditioning Units 2 to 25 tons
Multi-Packaged Systems up to 60 tons
Evaporative Condensers
Packaged Water Chillers
Air Handling Units
Window Units

And Typhoon leads in air conditioning for the home — with a complete line of year-round heating-cooling units and heat pumps

TYPHOON
AIR CONDITIONING

The Typhoon franchise puts you on the smoothest-working factory-dealer team in the business. Write for information today.

Typhoon Air Conditioning Co., Inc.
794 Union Street, Brooklyn 15, N. Y.

Specialists in Air Conditioning Since 1909

P-4

Typhoon Air Conditioning Co., Inc.
794 Union St., Brooklyn 15, N. Y.

I would like to know more about the Typhoon Franchise.

Name____________________________

Firm____________________________

Address__________________________

City______________Zone____State________

add extra profit to your air-conditioning business,

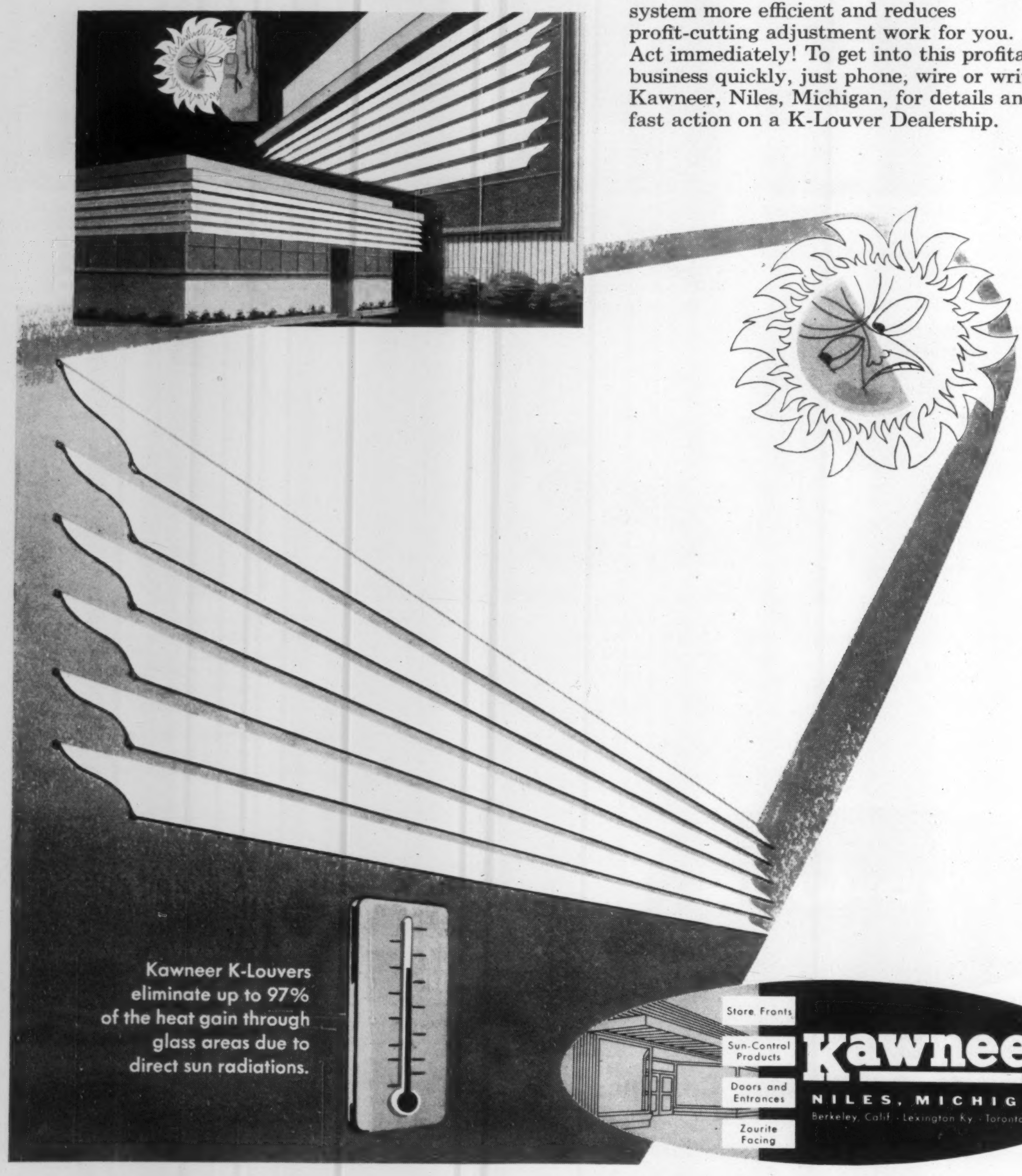
stop sun heat-load with the new Kawneer K-LOUVER

Increase business

When you make K-Louvers part of your air-conditioning job, you get more business because you can offer a prospect all these advantages: Lower operating costs as K-Louvers take sun heat-load off windows. Greater comfort—no "hot spots" near windows or "cold spots" in center of room. And attractive, new architectural lines add a distinctive touch to the exterior of your customer's building.

Increase profits

Profit is excellent because you can handle K-Louvers easily, efficiently. Lightweight aluminum is quickly fabricated on the job. Installation is simple. And the reduction of the sun heat-load makes your air-conditioning system more efficient and reduces profit-cutting adjustment work for you.
Act immediately! To get into this profitable business quickly, just phone, wire or write Kawneer, Niles, Michigan, for details and fast action on a K-Louver Dealership.

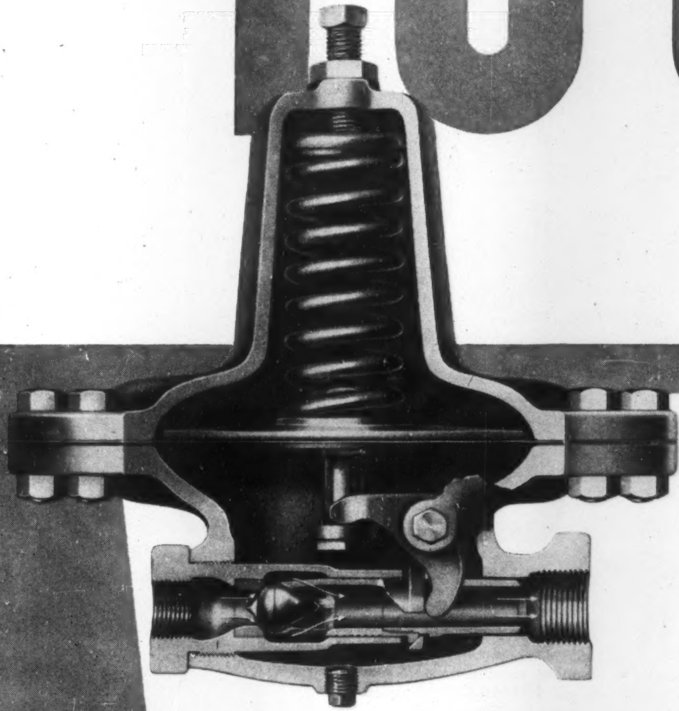


Kawneer K-Louvers eliminate up to 97% of the heat gain through glass areas due to direct sun radiations.

Store Fronts
Sun-Control Products
Doors and Entrances
Zourite Facing

Kawneer
NILES, MICHIGAN
Berkeley, Calif. · Lexington Ky. · Toronto, Can.

TYPE 1000 VALVE



Any product of quality should be dependable when *ordinary* products fail. Sudden pressure fluctuations, dirt, scale and viscous matter prove "fatal" to ordinary pressure reducing valves.

The CASH STANDARD TYPE 1000 VALVE however, is designed to operate with complete dependability under the most difficult and unusual circumstances. Many of these units have been in service over 10 years and have never been taken "out of the line."

Truly an *EXTRAORDINARY* achievement of quality and design excellence.

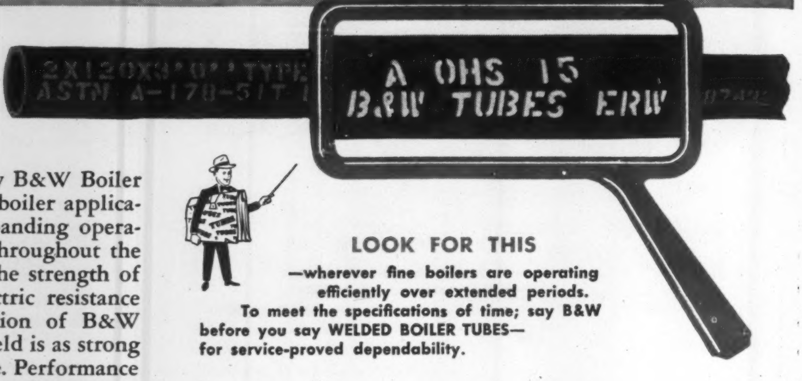
*** INSTALL CASH STANDARD "TYPE 1000" VALVES**

CASH STANDARD **DECATUR, ILLINOIS**

A. W. CASH COMPANY

you get UNIFORM WALL THICKNESS

with B&W *Welded Boiler Tubes*



The measured precision found in every B&W Boiler Tube makes for ease of fabrication in boiler applications. Of particular importance in expanding operations, this unerring uniformity exists throughout the entire tube length. From end-to-end, the strength of the tube is constant. Further, the electric resistance welding process used in the production of B&W Welded Boiler Tubes insures that the weld is as strong as the strip from which the tube is made. Performance in service, the true test for any product, has proven that B&W ERW Boiler Tubes pay their way . . . longer and with an evenness of operation that means long-run savings for you.

For three quarters of a century, B&W has been directly concerned with developing and applying boiler tubes for all pressures up to those approaching 3000 psi. The application of this extensive knowledge and experience results, naturally, in the production of finer welded boiler tubes.

For ease of fabrication and long service life specify B&W ERW Boiler Tubes for the tubing in your boilers.

LOOK FOR THIS

—wherever fine boilers are operating efficiently over extended periods. To meet the specifications of time; say B&W before you say WELDED BOILER TUBES—for service-proved dependability.

B&W SEAMLESS and WELDED TUBES

TA-4026 (CWP)

THE BABCOCK & WILCOX COMPANY
TUBULAR PRODUCTS DIVISION
Beaver Falls, Pa.—Seamless Tubing; Welded Stainless Steel Tubing
Alliance, Ohio—Welded Carbon Steel Tubing

THE EDITORS' PAGES

• *TWENTY-FIVE YEARS isn't a very long time (as we realize more and more the older we get.) However, "25" is a good round number, and the 25th anniversary of a magazine must be marked in some way. So several of the articles this month review a few of the many things that have happened in the past quarter of a century. We know you'll find them interesting. More importantly, perhaps, they also take a peek or two at the future.*

Many Changes During 25 Years in Heating, Piping, Air Conditioning

. . . next 25 the busiest?

Back in 1928, the coming publication of "a new monthly technical journal to serve the field of heating as applied to the larger types of construction, power and process piping, and air conditioning" was announced. A few months later, in May 1929, the first issue of Heating, Piping & Air Conditioning came off the presses and was mailed to several thousand "charter subscribers" — many of whom (plus several thousand other readers) have renewed their subscriptions year after year. To them, we express our deepest thanks.

In that May issue of '29 was published the Journal Section of the American Society of Heating and Ventilating Engineers. The Journal Section — containing the wealth of design, application, research and other data developed or sponsored by the ASHVE — has appeared regularly in HPAC, as it does today. We continue to enjoy this unique relationship — as we have over the years — between the leading publication in this field and the leading engineering society. We are proud of the opportunities this relationship gives to better serve the engineers and contractors who devote their business lives to heating, piping and air conditioning work.

In addition to the editorial pages (including the Journal Section) of that May 1929 issue of HPAC, there was — we happily remember — a husky quota of advertising pages. The advertising messages of many of those leading manufacturers have continued to appear in HPAC; several will be found in this May 1954 issue. To them — and to the others who have used our advertising pages to talk to you — we also say "thanks."

We are of course very naturally gratified that, quite by chance and without any particular "selling effort" on the part of our advertising staff, this month's 25th anniversary issue of HPAC carries the biggest advertising volume of any of our regular issues (that is, other than our annual January Directory numbers) since Vol. 1, No. 1.

In the 1928 announcement appeared the names of HPAC's first board of consulting and contributing editors. It is, we think, interesting to note that of that 1928 listing of 22 names, 10 still serve on this board (which is listed on page 5 this month.) To them — and to the other members of our board of consulting and contributing editors—we express our sincere thanks. Articles by several of these board members are published this month; photos of several other members of the first board appear on the next page.

While we are in this "historical vein," it is perhaps interesting to note that all of the officers of the Keeney Publishing Co. (the publisher of Heating, Piping & Air Conditioning) have worked on the magazine since its first issue.

There have, of course, been many, many developments in the rapidly expanding and growing field of heating, piping and air conditioning since our first issue was published. It would be impossible even to summarize them in a single issue, so the "review" articles this month are intended to hit only a few of the highlights. Many important events have undoubtedly been omitted, but of course have been covered in HPAC over the years. We shudder sometimes to think of the 20,000,000 words and more we've checked and proof-read.

Heating was of course a well-established plant and building service in 1929, although its importance, methods and techniques, and equipment have — in many respects — changed greatly during the last 25 years. Some of these developments are mentioned in articles in this issue. To choose but one of many examples, even the term radiant or panel heating was practically unknown in the U. S. in 1929; we believe the first paper describing British practice was published between HPAC's covers in the early '30's. The late Dr. Giesecke presented, in a series of articles many years ago in HPAC, one of the first methods for designing radiant heating installations. This method is still in use by many today.

Piping has served mankind for centuries. But piping — "industry's greatest transportation system," as it was called by the late A. W. Moulder in one of his several articles on this important subject published years ago in HPAC — has developed tremendously from many aspects in 25 years. Welding is but one example. One of the earliest articles on pipe welding appeared in HPAC. We are proud of the fact that, since our first issue, we have been the only

"Quote"

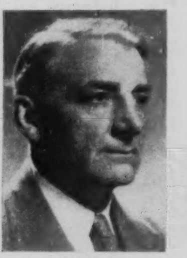
"In years to come, air conditioning and cooling for summer may become a necessity rather than a luxury." — *Willis H. Carrier, in his article in the first issue of Heating, Piping & Air Conditioning, May 1929.*

HPAC EDITORIAL BOARD

Many of the members of HPAC's first board of consulting and contributing editors serve on it today. Other photos appear with various articles in this issue.

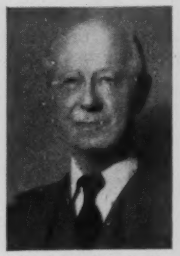
Sabin Crocker

John C. Hornung



Lee P. Hynes

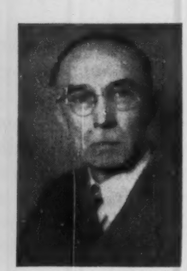
Charles Kimball



Dwight Kimball

Charles S. Leopold

Alfred J. Offner



Frank B. Rowley

Robert P. Schoenijahn

magazine to devote major attention to this most important subject of piping, and have always included it in our title.

While air conditioning was "born" in the early years of the century — though comfort cooling was not unknown in the 1800's — it was pretty much of a new term in 1929. We are pleased to recall that, for many years after the publication of our first issue, we were the only magazine to include the words "air conditioning" in our title and to give major editorial attention to this still rapidly expanding field. As far as we know, it was some years, too, before any of the societies or associations revised their names to include the words air conditioning.

Incidentally, we were interested to note that one of our earliest articles on the fundamentals of air conditioning was reprinted just a few months ago, in a revised version (with our permission) by a publisher of data sheets.

We could go on and on in this mood — and probably would if all this reminiscing wasn't beginning to make us feel pretty old. Then, too, it's the next 25 years and not the last that are important now.

We look forward to an even more rapidly expanding field of heating, piping and air conditioning for the future. All today's indications point, we think, to the growing importance of these services in plants and buildings of all kinds. The first 25 years may be the hardest, as the saying goes, but the next 25 will undoubtedly be the busiest. And we'll try to stop talking so much about ourselves again until our 50th anniversary!

"Best Quarter on Record for Air Conditioning"

. . . demand tremendous

THE "BEST first quarter on record" for the General Electric Co.'s air conditioning division was reported by F. J. Van Poppelen, general manager of the division. Orders for most lines were up 100 percent over the first quarter of 1953 — the division's previous record year.

Mr. Van Poppelen reported shipments for the first quarter of 1954 were more than double those of the same period last year.

"The demand for air conditioning and heating equipment has been tremendous," he said. "A new plant acquired last August has helped us boost production to meet this demand and still another plant will be added during the second quarter." Plans are under way for further expansion in the next several years.

"The air conditioning industry is one of the bright spots in the nation's economy," said Mr. Van Poppelen. "The words 'slump' and 'recession' are unknown in the industry today. Seasonal changes too, are being minimized by new merchandising techniques."

Mr. Van Poppelen said that one of the indicators pointing to an excellent year for air conditioning in 1954 is the fact that dollar volume of commercial and residential construction for the first quarter is up from 1953 levels and should continue relatively high throughout 1954.

"Higher construction figures are almost synonymous with higher air conditioning figures," he noted, "because no commercial building is considered truly modern today unless it is air conditioned. The same trend is evident in the residential field. However, the air conditioning industry can expect to move ahead much faster than new construction because of the big market in existing buildings."

Contract Awards Hit New Highs

. . . see booming construction

CONTRACT AWARDS in March for future construction in the months ahead smashed all records, F. W. Dodge Corp. has announced. The reports cover the 37 states east of the Rockies.

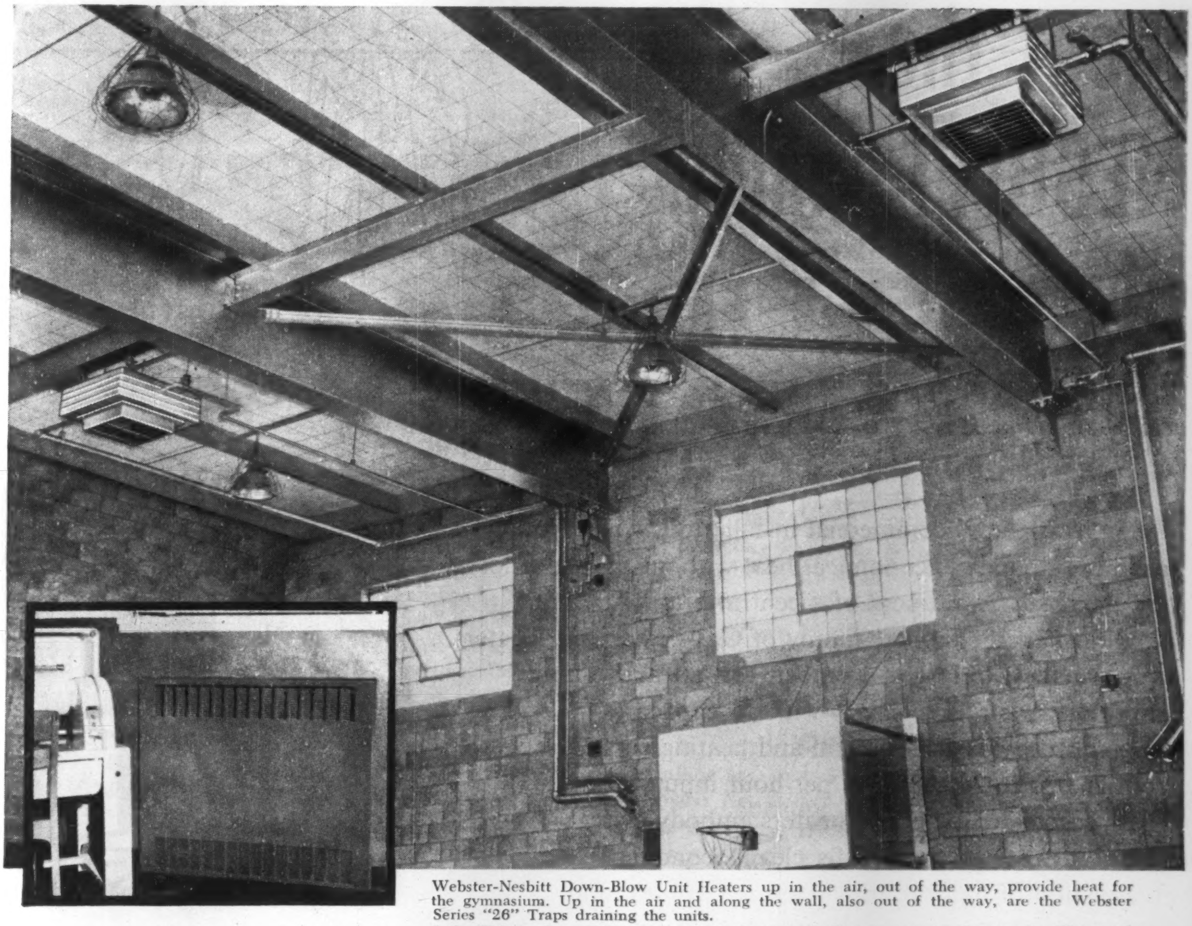
1) March contract awards reported were the highest for March in the 63-year history of the reports.

2) March rounded out the highest first quarter in their history.

3) New highs were set for March and for the first quarter in each basic category — non-residential, residential, and public works and utilities.

Also, March was the seventh month out of the past 12 to set new high records.

Said Thomas S. Holden, Dodge vice chairman: "It may now be said likewise that the record-breaking total of the figures for the first quarter of this year foreshadow some very bright and booming records of construction activity in the months ahead as the contracts are completed."



Webster-Nesbitt Down-Blow Unit Heaters up in the air, out of the way, provide heat for the gymnasium. Up in the air and along the wall, also out of the way, are the Webster Series "26" Traps draining the units.

Left: Webster Type E Convector alongside ironer in home economics department. The metal front is finished in a bright contrasting color.

HIGH SCHOOL FOR 1000 STUDENTS

When first put in service in September 1951 the new Ewing High School had 665 pupils from grades 7 to 10 using 24 of the 32 classrooms. Full capacity of the school was used in the fall of 1953.

Ewing High School is steam heated. Webster Heating Equipment used includes:

Webster-Nesbitt Down-Blow Unit Heaters in gymnasium as illustrated.

Webster-Nesbitt Propeller Fan Unit Heaters in locker rooms, manual training rooms and cafeteria kitchen.

Webster Convectors in home economics room (illustrated), auditorium, corridors, stair landings.

Webster Radiator Valves, Thermostatic Traps and Float and Thermostatic Traps throughout to assure steam circulation.

Modern schools and Webster Heating Equipment are found together all over America. For more information call your Webster Representative or write us.

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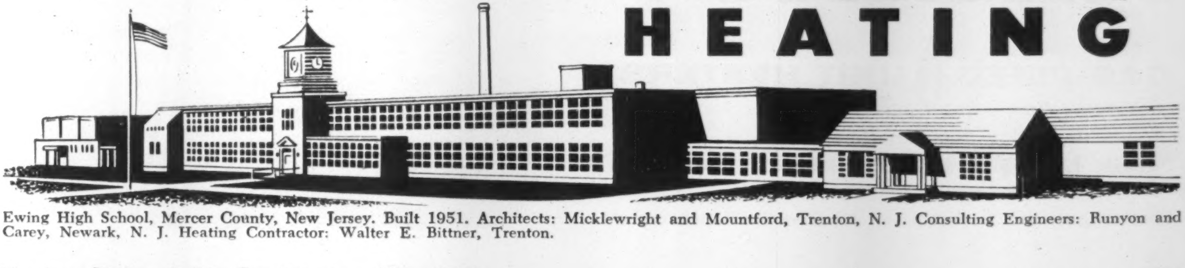
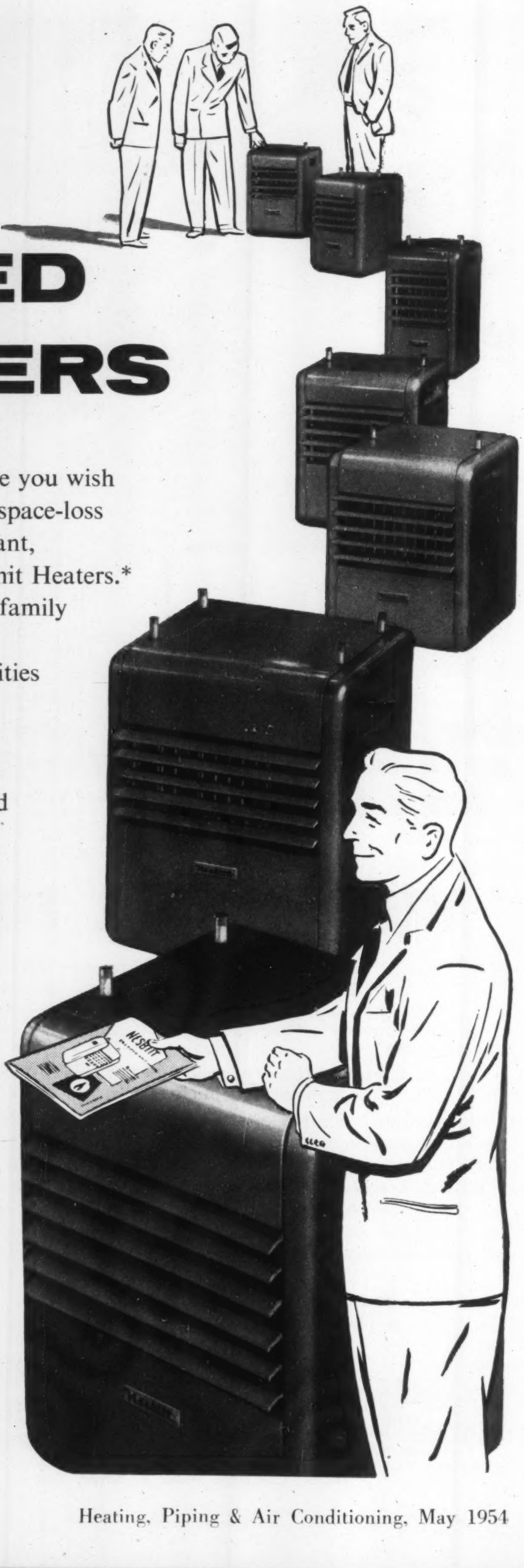
In Canada, Darling Brothers, Limited, Montreal

Webster
HEATING



Ewing High School, Mercer County, New Jersey. Built 1951. Architects: Micklewright and Mountford, Trenton, N. J. Consulting Engineers: Runyon and Carey, Newark, N. J. Heating Contractor: Walter E. Bittner, Trenton.

meet the NESBITT family of GAS-FIRED UNIT HEATERS



For industrial and commercial installations where you wish instant, automatic, economical heat without the space-loss and the costly investment of a central heating plant, Nesbitt offers a complete family of Gas-Fired Unit Heaters.* From smallest to largest member, this attractive family comprises seven basic sizes—with air capacities ranging from 400 to 2900 cfm and heating capacities from 25,000 to 200,000 Btu per hour input. These suspended type unit heaters embody every advanced feature for the safe, clean, economical combustion of natural, manufactured, mixed, and LP gases or LP gas-air mixtures . . . and for the quiet, efficient distribution of dependable heat under fully automatic control. Every detail of their superior construction, smart styling, and decorative appearance conforms to the standards of excellence always associated with John J. Nesbitt, Inc.

Users, contractors, and wholesalers interested in full details and application data of Nesbitt Gas-fired Unit Heaters . . . write for Publication 280

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"OPEN FOR DISCUSSION"

• *WE FOLLOW HERE each month the practice at engineering society meetings of providing an "open for discussion" period. You are urged to take part. Just address your comments to the Editors, Heating, Piping & Air Conditioning, 6 N. Michigan Ave., Chicago 2.*

JAMES B. RISHEL —

"In Selecting Oil Consider All Factors"

WITH REFERENCE to the article entitled Use Light or Heavy Oil, by Robert I. Anderson in the April HPAC, I would like to point out some design considerations that in my opinion definitely should be reviewed prior to the selection of No. 2 or No. 5 oil for heating school buildings.

No. 5 oil is a residual fuel and is not controlled closely in production as are the light oils Nos. 1 and 2. All residual fuels include some impurities which are not combustible.

At first glance it would appear that all of the difference in cost between heavy oils and light oils would be a direct saving for the school board. Actually, the overall efficiency of the boiler-burner combination using heavy oil will be somewhat lower than the same boiler-burner-combination using light oil. This is due to the heating surfaces being coated with particles of unburned carbon deposited by the heavy oil burner. Also, the amount of excess air required for heavy oil on many burners that are commercially available today is higher than the excess air requirements for burners using light oil. This resulting insulation of the heating surface and higher excess air requirements result in exit stack temperatures that may be appreciably higher for heavy oil.

The average custodian in a small school is generally not capable of setting and maintaining accurate fuel air ratios. Therefore, he is not able to maintain a heavy oil burner at peak combustion efficiencies. In order to maintain good efficiencies in this situation, it will be necessary to set up a definite maintenance schedule on heavy oil which will include cleaning the burner, the oil strainers and the boiler flues. It is our belief that a school burning 10,000 gal of oil per year is not suitable for heavy oil if costs per 1000 lb of steam generated are actually considered, where these costs include all boiler room costs and not just comparative fuel costs.—JAMES B. RISHEL, James B. Rishel Co.

R. LISSON —

"Oil Heating Comparison Valuable"

I FOUND the article by Robert I. Anderson on the study of the comparative costs of heating school buildings, under the conditions outlined, which was published in the April HPAC, to be most informative and valuable. It leaves no doubt in my mind that the logical fuel is No. 5 fuel oil. Studies of this type are all too infrequently made, with the result that many institutions are operating on the more expensive No. 2 fuel oil, where considerable economies could be achieved if a little time had been spent in making a similar study in comparative operating costs.

It would be quite interesting to know if other HPAC readers have made or know of similar studies for larger installations using No. 6 fuel oil, evaluating the operating costs on No. 6 oil using either low pressure steam oil heaters, or sub-water-line oil heaters as contrasted to straight electric oil preheating. Several large schools in an eastern seaboard city are being designed around a straight electric oil preheating system from storage tank to burner atomizer. Data justifying such a decision in the face of high electric costs should be rather enlightening.—R. LISSON, Davis Engineering Corp.

O. W. GRAVELEY —

"Piping Maintenance Data Useful"

THE ARTICLE by Robert J. Pinske, Piping Maintenance Practices Surveyed, in the April HPAC is excellent and contains much detail. The work which he has done in compiling data and organizing the general form of piping maintenance practice is very valuable.

From my experience, it is possible to say that his proposals can be included in any good plant maintenance program. The tables prepared on the costs of water, air and steam leaks are extremely useful in calling this matter to the attention of both management and operators. The principles included in the section Measuring of Piping Maintenance are calculated to cause full consideration of maintenance practices and improve efficiencies.

We wish to congratulate Mr. Pinske on a job well done.—O. W. GRAVELEY, Works Engineer, Electro-Metallurgical Co., Div. of Union Carbide and Carbon Corp.

K. E. ROBINSON —

"What Are Actual Operating Conditions?"

AS I READ the article entitled Unique Air Balancing System in the January HPAC, I found it to be very interesting, but I get the impression that all of the statements are telling how this system is supposed to work. I would be interested in knowing what the actual temperature and humidities are which are maintained by this balancing method. There is a question in my mind as to whether humidities approaching those stated in the article can be maintained by a system such as is described here with only the use of automatic controls. Under the subhead Winter Humidity Control, a control action is given if the humidity rises above 55 percent. From this statement, I assume that moisture is getting into the air stream from the building. If this is so, I am puzzled as to how the outside temperature during the summertime can be expected to reduce this percentage.—K. E. ROBINSON, Ventilation Engineer, General Motors Corp.

REPLY TO COMMENT — Mr. Robinson is quite right that moisture is getting into the air stream within the building. White oak barrels of whiskey are stored in racks throughout the building. The continuous slow evaporation from the outside surface of the barrels increases the humidity inside the building. If not lowered by the system described in the article, the absolute humidity inside the house will frequently be higher than the absolute humidity outside. The purpose of the controls is to automatically make use of the outside conditions when favorable.

During the summertime, in the early morning hours before sunrise, both the temperature and absolute humidity of the outside air are frequently below those inside the warehouse. When this situation exists, the air is brought in. While the relative humidity can be lowered by bringing in outside air during the summer months, it cannot be held as low as 55 percent except in the winter.

The range of temperatures will run from about 50 F in the winter to 80 F in the summer.—HAROLD ROLAND, General Production Manager, Hiram Walker Distillery, Inc.

J. R. FELLOWS —

"What Is Range of Temperature Control?"

THE SYSTEM described in the article, Unique Air Balancing System, in the January HPAC is very interesting. The method of control is especially interesting, but I believe it could be stated more clearly. The statement "Maintenance of the average annual temperature" in the warehouses by the air balancing system would imply that the temperature will be controlled at around 50 F at all times—regardless of the season of the year. However, it is later stated that the higher summer temperatures in the warehouses are offset by the lower winter temperatures, and there is no mention of mechanical cooling. Therefore, it is quite evident that they really do not try to keep the temperature in the warehouse constant at 50 F or at any one value. I would be interested in knowing what the range of temperature control is that is actually obtained the year around in the warehouses with this air balancing system.—J. R. FELLOWS, Professor of Mechanical Engineering, University of Illinois.

REPLY TO COMMENT — In answer to Professor Fellows' comments, I would like to reply that we are merely attempting to condition the warehouses used for the storage of barreled whiskey so that the desired relationship between age and average temperature can be maintained. No mechanical cooling is used in these warehouses. Therefore, Professor Fellows is right that we make no attempt to keep the temperature constant the year around. Maximum temperatures inside the warehouses in the summer are kept as low as possible by bringing in outside air in the early morning hours before sunrise, whenever both temperature and absolute humidity outside are below the inside conditions. We are naturally limited by the weather in the summer control. The average summer temperatures in the warehouses will be higher some years than others.

During the winter months, the average temperature to be maintained is determined by our experience during the previous summer. High summer temperatures require lower winter temperatures and low summer temperatures require higher winter temperatures so that the weighted average temperatures over the entire year will equal a specific temperature. This is what was referred to as the average annual temperature. The range of temperatures may run from 80 F in the hottest part of the summer to 50 F in the winter. The desired average annual temperature may change from time to time with changes in long range warehouse storage programming.

I hope this brief explanation may help to clarify the article for you.—HAROLD ROLAND, General Production Manager, Hiram Walker Distillery, Inc.

ROBERT W. STAILEY —

"Carbon Filters Used on USS Nautilus"

I WOULD LIKE to add some comment regarding the article in the February HPAC about the launching of the new atomic submarine, the USS Nautilus, by Howard S. Dewey. In gathering information about this launching, we obtained some additional interesting data which you may wish to pass along.

First, we know that all of the air in the Nautilus is delivered through the air conditioning system, which is operated by surplus power from the reactor. We conjecture that the air purification system employs first a scrubber to remove CO_2, then carbon filters to remove gases and odors, plus stored compressed oxygen which is then bled into the revitalized air at a specified rate.

Other carbon filters are used on the vent stacks of the waste tanks from the galley and head, and still others by the individual commodes in the lavatories. The overall size of the principal filters is 24 in. × 30 in., which gives some idea of the effectiveness of the activated carbon material. Reactivation can be done at sea, which extends the usefulness of the filters. Similar filters are being planned for installation on the Sea Wolf, our second atomic submarine now under construction. Filters of the vent stack type have been supplied for conventional submarines for some years, but the really new feature of the Nautilus is its complete air conditioning system. I understand that the reactor develops a considerable amount of heat, which necessitates the need for air conditioning.—ROBERT W. STAILEY, Byer & Bowman, for Barneby-Cheney Co.

W. E. TRACY —

"I Would Like To Add To Report"

IN THE REPORT of the industrial ventilation conference published in the April HPAC, I would like to add the fact that the demonstration of fan connections which I presented at the conference was sponsored by the Sturtevant Div. of Westinghouse Electric Corp.

HPAC's report of the conference was interesting and well presented, reflecting the true atmosphere of this important conference.—W. E. TRACY, District Sales Engineer, Sturtevant Div., Westinghouse Electric Corp.

W. T. ANDERSON —

"I Question Summary of Nagy Article"

I WISH to comment upon the article, Disinfecting Air with Sterilizing Lamps, by R. Nagy, G. Mouromseff and F. H. Rixton, which was published in the April HPAC.

The box on page 83 entitled What the Tests Show appears to be the summary and contains the substance of the article.

It is our opinion that the five statements made in this box are in some respects ambiguous. For example, No. 1 and No. 2 appear to state that the investigations reported in the article are in disagreement with those of Wells, Whisler and Luckiesh in that these earlier investigators found that airborne organisms in still air require the same amount of energy for destruction as similar organisms on Petri plates, regardless of the relative humidity, whereas, Nagy et al found that at low relative humidities, airborne organisms were destroyed by 1/5 to 1/10 of the radiant energy required for similar destruction of organisms on Petri plates. In item No. 4 Nagy et al state that only at high humidities is the amount of energy needed to destroy airborne organisms of the same order of magnitude as organisms on Petri plates. Here they appear to be in agreement with Wells, Whisler and Luckiesh, but in Nos. 1 and 2 they were diametrically opposed to that previous finding.

It might be well to direct attention also to a paper by J. Voogd and J. Daams, *Philips Technical Review*, Vol 12, 4th issue, page 116, October 1950, inasmuch as Nagy et al appear to be unaware of this paper. Voogd and Daams state that "one of the most common applications of germicidal lamps is for the sterilization of air — either stationary or in motion. Investigations have shown that the doses required to reach a certain degree of inactivation of germs in the air are very much smaller than those that follow from measurements taken from suspensions and from cultures on Petri dishes. Whereas, for B. coli in an aqueous suspension, a dose of about 10 milliwatts per sec per sq cm was required to reduce the number of bacteria to between 1 to 0.1 percent, in a suspension atomized into the air, the same effect was reached with a dose of one milliwatt per sec per sq cm." These results are in agreement with those recorded by Wells and others and in apparent disagreement with Nagy et al.

Voogd and Daams give the following explanation for this effect of the medium on the killing action of ultraviolet rays. They say that in a suspension in a liquid medium such as a Petri dish, there is practically no diffraction or scattering of the rays on the surface of the bacterium, so that there is the same intensity everywhere inside the bacteria as in the surrounding liquid. In the case of a suspension atomized into the air, the curvature of the surface of the bacterium, allowing for interferential phenomena, could result in about twice the intensity of ultraviolet radiation within the micro-organism than outside of the organism.

In a similar manner, droplet size is undoubtedly of importance because of the existence of an optical magnification factor. In some respects the situation is analogous to that experienced by a bather who stands in the sunshine with small to large drops of water on his bare shoulders. If his skin is tender, the ultraviolet in the sunshine is sufficiently intense and if he exposes himself sufficiently long, the result will be a blister where each droplet of water was located. On the other hand, if he had dried his shoulders with a towel immediately after emerging from the water and had then stood around in the same sunshine for the same length of time, such blister formation would not occur. The effect of this lensing action varies with the size of the droplet. A similar action can be expected when the droplet contains a bacterium.

Since airborne bacteria — which can be killed by ultraviolet light — are usually associated with moisture in the form of droplets, it is possible to understand from the consideration of optics alone how these may be more readily killed than the same bacteria in suspension in a Petri dish. Bacteria that are dehydrated and associated with dust can be killed only with great difficulty with ultraviolet radiations.

Nagy et al cite in No. 1 that the moisture in the air has no appreciable absorption for bactericidal radiations, and therefore water per se would not account for the results reported by Wells, Whisler and Luckiesh. Anyone who has had any experience with fogs knows that moisture in the air can have a very appreciable absorption and scattering effect. In the case of a fog, the moisture is present in the air in very large droplets, whereas in the case of high humidity, the moisture is present in exceedingly small droplets which do not record at all on the eyes of humans but which are still large to a bacterium. In consideration of the optics indicated, such minute droplets of moisture may scatter the ultraviolet radiations and protect a bacterium which is still smaller, although the relatively large photocell used to measure the radiations may indicate no appreciable absorption by the moisture in the air. It appears to become a question of relativity, and it is necessary to project oneself to a size of a bacterium in order to comprehend the situation.

With respect to No. 5, it has been generally recognized that there is an increased ultraviolet efficiency with increased air velocity but not to the magnitude indicated by Nagy et al.

We hope that these comments will be of interest and will not help to increase the confusion.—DR. WM. T. ANDERSON, Director of Research, Hanovia Chemical & Mfg. Co.

L. J. BUTTOLPH —

"Are Results in Nagy Article Consistent?"

WHILE THE ARTICLE, Disinfecting Air with Sterilizing Lamps, in the April HPAC was interesting and informative, I would like to offer some comments about the contents of the article. Although we are rather thoroughly familiar with the voluminous literature in this field, neither I nor my associates are able to reconcile the data presented in Tables 2 and 3. Among the several inconsistencies, I would point to those in Table 3 which seem to indicate that 369 microwatt sec per sq cm in air at 5800 cfm provides a 36.8 survival (63.2 kill) when supplied by lamp A, when only 251 microwatt sec per sq cm from lamp B produces exactly the same results under the same conditions. This would seem that the two lamps provide ultraviolet energies of differing lethal characteristics, or perhaps the authors are not talking about ultraviolet microwatt sec per sq cm.

Our general criticism of the paper is that it is too largely devoted to demolishing unimportant straw dummies conjured out of the references for no very obvious reason.—L. J. BUTTOLPH, Lamp Div., General Electric Corp.

THE AUTHOR REPLIES—Thank you for the opportunity to offer a reply to Mr. Buttolph and Dr. Anderson regarding their comments about our article published in the April HPAC.

The article was primarily compiled to present data to engineers on the amount of ultraviolet radiation necessary to destroy approximately 90 percent or more of air borne organisms in air conditioning ducts. Those that are familiar with the voluminous literature know that a number of authors have reported that air borne organisms at low relative humidity require approximately 1/10 of the energy as similar organisms in water for equal killing. In our article, we have attempted to show reason for this anomoly and further to point out that in practical air conditioning installations where we are interested in destroying more than 90 percent of the air borne organisms, the amount of energy necessary is of the same order of magnitude as similar organisms in water. We believe we should point out the fallacy of using low values obtained for small percent kill and extrapolating these latter figures to practical installations at high percent kill. It is true that more lamps must be used in an installation. However, we wish to present the facts as they are and not as we would like to see them.

All of the existing data indicate that turbulence is a factor in destroying air borne organisms. The difference in values in Table 3 for lamps A and B can readily be explained on this basis, the latter lamps creating considerably more turbulence because of their number.

The suggestion of J. Voogd and J. Daams, *Philips Technical Review*, Vol 12, page 116, 1950, that the increased effectiveness of ultraviolet radiations can be attributed to the lenticular action of the water drops is not tenable. These authors state that "the intensity may be about twice that outside the organisms". This does not explain the ten to one factor which they report in their tests.

Moisture at normal relative humidities exists in the vapor state. The moisture under these conditions has no appreciable absorption for bactericidal radiations. The fog referred to by Dr. Anderson is composed of water droplets 2 to 50 microns in diameter which reduce transmission of radiations by refraction. Such conditions are not encountered in air conditioning systems.—RUDOLPH NAGY, Research Dept., Lamp Div., Westinghouse Electric Corp.

A. N. SHELDON —

"Our Studies on Double Glazing Showed Savings"

THE FOLLOWING comments refer to Charles F. Neergaard's article in the November HPAC on the subject of reducing hospital heating costs. I was interested in this article particularily with regard to the economy derived from double glazing steel sash and Samuel R. Lewis' comments on this in the January HPAC.

Some years ago we conducted a series of tests to determine the heat transmission through various types of sash — both single and double glazed — and submitted the results in a paper presented at a meeting of the American Society of Mechanical Engineers in December 1916. This paper was published in Vol. 38 of the Transactions, pp. 857 to 878.

Our investigation indicated savings of 29 percent and 21 percent when the heat head was 70 F and 40 F, respectively, for the sash per se. We did not measure the heat loss from perimeter leakage or infiltration — as it would of course be affected by many variable factors.

Our tests on wood sash indicated a saving of 49 percent and 42 percent, respectively, under the same conditions as above.—A. N. SHELDON, Engineer, F. P. Sheldon & Son.

J. DONALD KROEKER —

"Article Should Be Read By Everyone in the Art"

THE ARTICLE on Promoting the Growth of Air Conditioning, by Arthur J. Hess, in the January HPAC, should be read by everyone who is involved in practicing the art, in my opinion. I think that Art Hess — in his informal, incisive, and provocative style — has called the shots on what I personally consider a measure of malfeasance in the industry. That's a harsh word but there are many instances in which I consider it justified.

Art's comments on engineering and engineers are certainly justified. However, I am disappointed in that Art has spoken in generalities. Corrections would have been much more likely to follow had he been as specific as he can be. I hope that he will follow with specifics.

Failure by engineers to follow up on their design is a justified though sad commentary. A number of years ago an engineer in the Pacific Northwest started the practice — now spreading — of his office doing the complete adjustments required in the systems subsequent to completion. His specifications provide an allowance for payment to the engineer for the cost of such adjustments. The system has worked very well and does provide final assurance that the job is installed as specified and working as contemplated.

Naturally, between the period of completing plans and specifications and the final adjustments, there are many additional follow-ups suggested by Art in his subtle way, on which I believe Art also should have been specific. I hope that Art will follow this fine article with specific examples that might apply to the engineer, the contractor, and the manufacturer, in order that widespread critical consideration of our own actions and methods which are stunting the growth of air conditioning may ensue.—J. DONALD KROEKER, Consulting Engineer.

E. H. McLANE —

"Would Like to Use Article To Serve the Owner"

THE ARTICLE on How NOT to Air Condition, by C. T. Baker, which was published in the November HPAC, is well written and has impressed many in our organization.

It is our belief, as this article points out, that as the result of numerous causes, the owner is often misled, ill advised or taken advantage of in this field of sub-contracting. We feel that there is a need to bring this article to the attention of owners who are planning to install air conditioning, as well as the architects, engineers and general contractors who will serve them. By so doing, everyone engaged in the field will have a better opportunity to serve the owner to the end that he will receive a well engineered, properly installed and adequately equipped system worth 100 cents for every dollar he has been asked to pay.

Please advise if reprints of this article are available, and if so the prices of same. If reprints are not available, we would like to have your permission to reproduce this article. — E. H. McLANE, Sales Manager, Coastal Equipment Co.

Says **William H. Bodendorf**, Pres.
WILLIAM H. BODENDORF & SONS
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>
> *"From my standpoint as a contractor I prefer Revere Copper Water Tube because it is easy to bend and handle . . . its long 60′ lengths require fewer fittings and the solder fittings used eliminate the need for welding, wrench work and thread cutting. And most important; Revere Copper cannot rust so it keeps me out of trouble, helps build my reputation for quality work."*

That Mr. Bodendorf has a reputation for quality work is attested to by the fact that of the more than 550 radiant panel installations he has made, he has never received a single complaint.

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ONE BIG FEATURE of Revere Copper Water Tube is that Radiant Panel Heating coils are readily prefabricated in the shop. Time is saved, working conditions are more ideal, installation costs are cut. BODENDORF & SONS get their Copper Water Tube needs through the Revere Distributor, WARNER SUPPLY COMPANY, Westfield, Mass.

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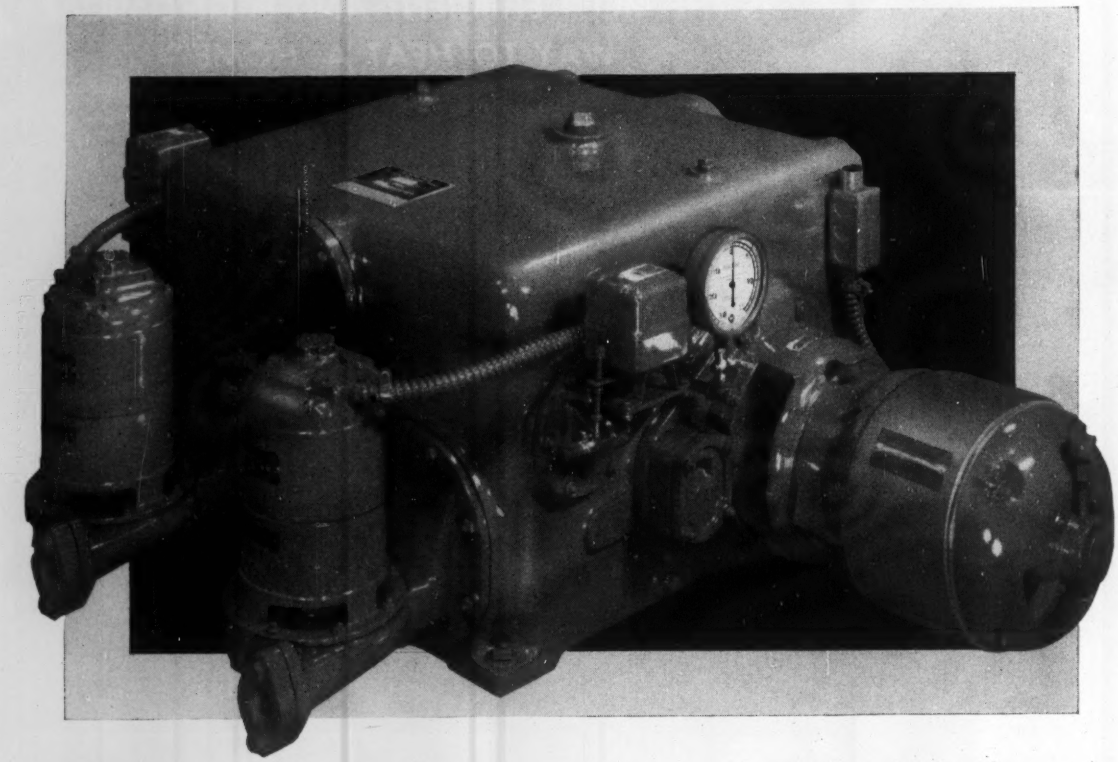
THIS NEW VACUUM HEATING PUMP IS SIZED TO ACTUAL JOB REQUIREMENTS



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No longer is it necessary for the Engineer to accept a vacuum heating pump with air and water capacities based inflexibly upon square feet of equivalent direct radiation. With the flexible Nash CSM he can provide for proper air capacity in accordance with his judgment and experience. For the individual capacities of the separate pumps on the CSM may be varied within a wide range, without buying an oversize receiver and oversize water pumps.

These pumps possess many other features which permit a more efficient utilization of fuel and minimum use of electric power. Low, low, returns reduce installation costs and usually eliminate putting the pump in a pit. Simplicity and efficient operation reduce supervision and maintenance costs. Information regarding this new heating pump development is available immediately upon request.

- ✓ **Increased air capacity induces rapid system response without wasteful overheating.**
- ✓ **Separate air and water pumps individually selected to meet actual job requirements.**
- ✓ **Control system that operates individual pumps only when needed.**
- ✓ **Flexibility permitting addition of radiation without changing basic pump installation.**
- ✓ **Low, low, return line connection.**

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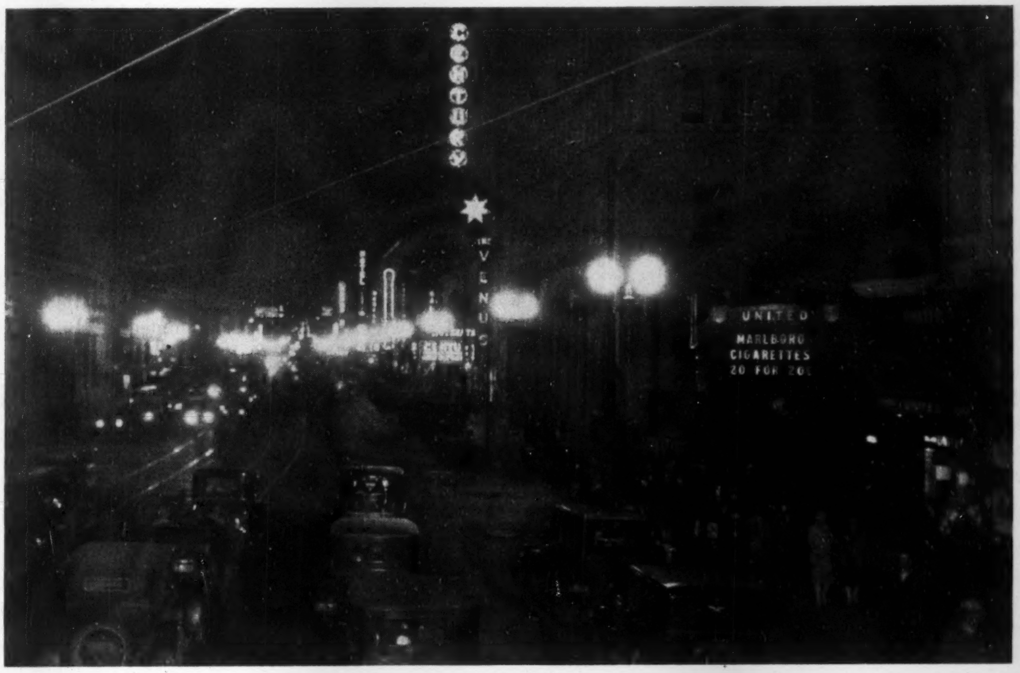


Things Were Different Then

There've been quite a few changes since 1929. You'll enjoy, we're sure, I. W. Cotton's easy-to-read review of some of the things going on 25 years or so ago. He gives particular attention to air conditioning and heating

By I. W. Cotton

AT THE TIME the first issue of HPAC was published in May 1929, the big depression had not yet hit, most of America was bullish and the goose hung high. Every time the stock market went up — which was most of the time — Arthur Brisbane's syndicated column gave out the joyful advice to accept the new highs as evidence of this country's impregnable business and financial standing, rather than as indications of optimism gone mad. "Don't sell America short!" he repeatedly cried — and the people believed. They wanted to believe.

The Overall Picture

Transcontinental air transport was teaming up with the Pennsylvania and the Santa Fe railroads to enable the hurried traveler to hop a sleeper one evening in New York, transfer to a plane at Columbus early next morning, resume sleeper travel that night at Clovis, New Mexico, and then reach Los Angeles by a second plane well before noon the second day. Ho, hum. New York tonight, Los Angeles day after tomorrow morning!

Automobile radiators looked straight down the road, unblushingly exposed to the public gaze with no concealing grille. Mighty steam huffed and puffed from the trains; the diesel had not yet threatened to invade the rails, although there were a few timidly whispered rumors.

Sulfa drugs were barely on the brink of recognition, penicillin was not nearly ready to spring into accidental existence in the laboratory of a scientist looking for something else. Insulin was lately in mass production and saving the lives of countless diabetics.

The Golden Gate remained unbridged; there were no gingerbread mixes or brown'n'serve delights. Cities used d-c downtown, (some areas still do), streetcars clanged, and the trolley bus with its fantastic twin poles shifting blithely about at impossible angles was a newcomer to most of the U.S.

War meant World War I. Folks talked occasionally about the fabulous ghastly new machines of destruction which would frighten all warmongers away from even the thought of a new conflict. And they were *not* referring to the split atom.

John Q. Public had never heard of TV, or of the shiftless gear, or the roomette. He was still largely unaware of fluorescent lighting and self-leveling elevators and the sadistic influence of the calory on American life. His eyes were still glistening at the sight of the daring advertising cut-outs of the one piece bathing suit beauty, and little did he realize that he hadn't seen anything yet.

The Heating Situation

By 1929 the oil burner, after an early tough struggle, had hit its stride. The domestic stoker had just made its appearance and achieved wide acceptance. Controlled heat had come into its own. The thermostat had brilliantly graduated from its initial role of handling dampers on hand fired furnaces and boilers to that of actuating the heating plants which warmed the populace.

Unknown, however, was the outdoor-indoor fuel-saving control — only a few of the many instruments and devices used so widely today to regulate our heating, cooling, humidity and air flow were in standard practice then. The low limit stat, and the high limit stat, and the humidistat, and the motor valve, and the reverse acting pressure and temperature stats, and automatic dampers — all were mostly rarities in 1929.

The light weight unit heater had been developed earlier in the '20's and by 1929 had attained sales volume large enough to accurately forecast its importance in industrial heating.

Scientists may have been discussing the possibilities of the heat pump, but the public and most engineers had heard little or nothing of any such subject. Panel heating was yet to be born, we did not have the directional flow register, and ceiling outlets were plain or ornamental plaques which changed vertical downflow into horizontal splash. Also, turning vanes for air ducts were rare indeed.

I. W. COTTON has been in the heating and air conditioning field for over 40 years. Among his activities was a three year term as chairman of the ASHVE's committee on research and he is presently a member of the ASHVE council. He is interested in civic affairs and is serving as a member of the Marion county (Indiana) council

Theaters Air Condition

Air conditioning had already made its first impact on the American way of life, however. Right down throughout the previous years, most of the theaters had to close all summer. Now they could justify what in the '20's was considered the high cost of air conditioning by remaining open *all year*, and the better financed and more progressive movie houses were installing air conditioning systems at an ever-increasing rate.

About 1926 a new and magnificent Chicago neighborhood theater capitalized on its air conditioning through novel and effective spot advertising. It ran a film showing and describing the system. This was not merely a dry and wearisome presentation of machinery. It dramatized you as the customer. Just a few minutes ago, you were walking down the stifling street miserably mopping your streaming brow, stopping in front of a thermometer which had blown its top, and dejectedly shaking your head.

Successful sound films had not yet appeared, and the old silent variety inserted wordings which ranged all the way from direct quotes showing what the actors were saying, to sprightly parenthetical or editorial comments. In this film, right after the thermometer episode, it showed a close-up of you, with the stiffly starched collar cruelly imposed on you then by heartless fashion, helplessly melting in the continuous stream of perspiration coursing down onto your neck. The picture was interrupted to ask "Remember the old catch line — 'Wilt thou? And he wilted!'?"

Heat Relief Featured

You, the hero, forced your lagging steps ever forward — and there, right ahead of you, was the theater with its big sign featuring relief from blistering heat as top billing and the show in smaller letters underneath. You brightened, facing the camera for a moment, then turned toward that blissful oasis of comfort and almost sprinted the last gasping steps to the swinging door.

Here they interrupted the film again, to tell you that their doors kept the heat *in* in winter and now kept it *out* in summer.

You lurched through the doorway into the lobby, and presto! — ah, the rapturous relief as that cool, dry air cascaded about you!

Another close-up of you, now smiling, utterly relaxed in immediate comfort. Another interruption, this time a quote, with you speaking in a reassuring manner.

"I surely don't mind this long line ahead of us tonight," you say to the man in front of you. "As long as it's this cool here in the lobby, they won't make me mad if it takes half an hour to get a seat."

They leave this one on a bit, so that you — now seated, of course, looking at yourself in the picture — have time to realize that the theater management has done so much for your comfort, and also has packed 'em in for the outstanding show they have in store for you. But first —

How Is Comfort Provided?

"And now, Mr. and Mrs. and Miss Customer, you may like to see how we provide such perfect conditions in the midst of this unprecedented heat wave."

First they showed the mighty blower, with ribbons streaming in the rush of air, a reminder of your present salubrity — and interrupted with a caption telling in unbelievable figures the vast volumes of atmosphere they were moving for you. Then came a brief view of the filter bank, with a longer showing of "before and after" — a pure white sheet quickly sullied and blackened when held in the intake, and another pure white sheet acquiring a barely noticeable off-white when held downstream. All of this was explained modestly: "We get well over 90 percent of the dust and dirt out of the air that you will breathe."

Next came the giant compressors, with an alert attendant walking about with confident bearing, showing that he was fully competent to keep the mammoth running, and with an almost reverent expression as he glanced briefly toward you, showing this time that he was conscious of what he was privileged to do for you.

A very brief explanation of the refrigeration cycle followed, in understandable wording: "We squeeze and compress large volumes of our refrigerant gas in these units, and *as you know*, this causes the temperature of the gas to rise sharply. We then remove this excess temperature by passing the hot gas through this bank of coils" — brief picture here — "which contain cool running water that flows away with the picked-up heat. With the gas compressed into small volume, and now cooled to about its original temperature, it turns into liquid form and is stored here" — another picture.

"Then this liquid is pumped through a tiny valve and permitted to expand into gas again, and in doing so, *as you know*, it must *take on* the heat which was removed from it.

"It gets this heat from the air flowing around these coils containing the gas, which is the air you will soon breathe.

"But these coils are really cold — so cold that much of the moisture in the air falls out, just like snow in winter." Then the picture is resumed — to show a view of the plenum full of swirling frost particles which, indeed, looked like snow and reminded you again of the utter desirability of your present comfort in the theater.

Refreshingly
COOL THEATRE
comfort
Refreshingly
COOL

Then came the climax. They showed a full face view of the audience, sitting in placid relaxation — with a quickie fade-out and a second view of the gasping, sweltering outside. Then the view was shifted immediately back to you and you and you, so comfortable in your theater.

Air Must Be Dry

The wording here included a frank bit of bragging about that particular cooling system. "In order to get the air fully ready to make you comfortable, we must dry it — dry it so thoroughly that when it reaches you it will be thirsty for that dripping perspiration that has been bothering you. It must dry you quickly, to do the job we want it to do for our customers.

"In drying it so thoroughly we have to get it cold, so that the moisture has to fall out." Another quickie of the snowy plenum was shown at this point. "It is so cold, in fact, that it would be too cold for your comfort. So we have to reheat it, to exactly the right temperature for you. This reheating we do with our regular heating plant." Now, a view of their boilers going full steam was shown.

"We actually run our boilers during the hottest weather of the season."

All for "You"

Then they wound up this "red hot" presentation of their mountain cool accomplishment with a final review — a repeat of you on the stifling street, you staggering into the lobby and instantly finding relief, you now sitting right there in the theater, with everything just right!

And what did you, as well as all of the audience, do? Why, you applauded — not just politely, you clapped and you cheered and you showed exactly what you thought of the theater and its thoughtful care of and for you.

The refrigerant then used lacked many of the attributes of our present highly developed standards, the air distribution was not completely draftless, but the teamwork of the engineers and the programmers along with the advertising staff produced a selling job that challenges everyone in the air conditioning industry to this day.

New Air Conditioned Hotel Attracts Meetings

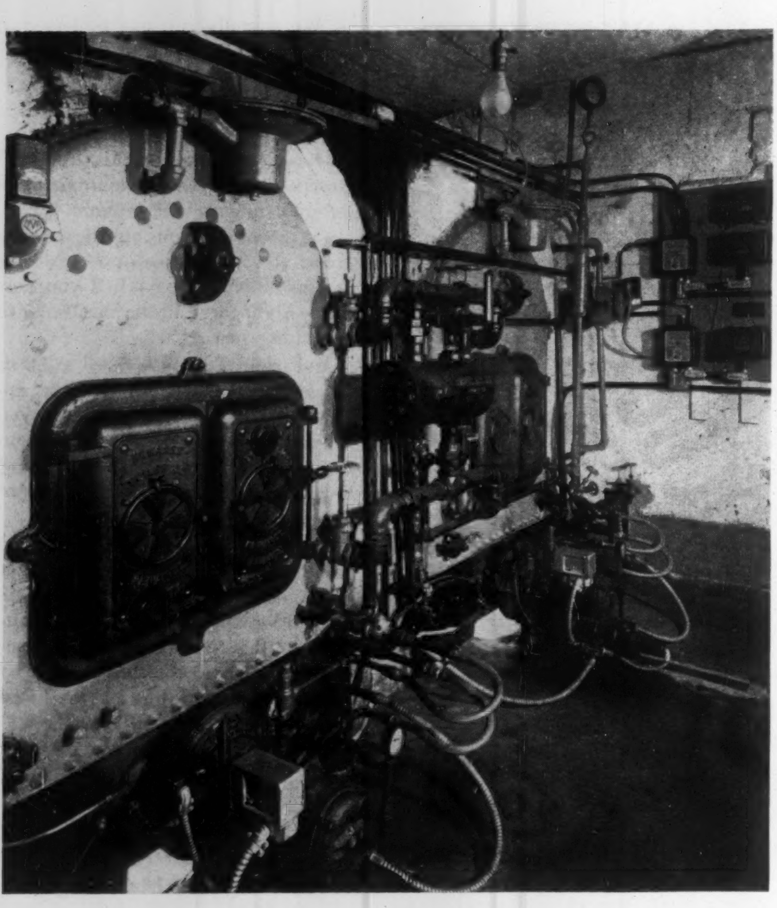
. . . 50 conventions scheduled

BEFORE THE doors of the new $2 million, completely air conditioned Baker hotel in Hutchinson, Kansas, officially opened, a return of funds invested by the people of Hutchinson was realized. Because the 175-room hotel is air conditioned, hotel officials were able to bid and obtain almost 50 state, regional and national conventions for this year. Ten conventions were booked for 1955 and several listed for 1956.

Raising of funds for construction of the 12-story hotel was a Hutchinson community project.

Chilled water for air conditioning the entire building is provided by a 250 ton centrifugal refrigerating machine, according to Carrier Corp.

The architect was McCrackin & Hiett, Hutchinson, and the associate architect was Neville, Sharpe & Simon, Kansas City. The consulting engineer was Howarth, Scott & Kinney, Kansas City; the general contractor, Dondlinger & Sons, Wichita; and the mechanical contractor, Stevens, Inc., Hutchinson.



Heating Changes Greatly

. . . in the last 25 years

By Kalman Steiner

Engineer
C. Hoffberger Co.

• Boilers have changed considerably in the last 25 years probably because of changes in fuel economics and progress in welding techniques. Oil burners, gas burners and stokers have all removed the need for hand firing any longer. The heating system has also experienced many improvements. Controls, however, have perhaps been changed more in the last 25 years than any other field of engineering. With a look to the future, nuclear energy and solar energy possibilities are also reviewed.

TECHNOLOGICAL CHANGE during the past 25 years has altered extensively the design, construction, installation and utilization of many component elements of the boiler room and heating system. These changes and developments are manifest in fuels, boilers, and combustion control, materials of construction, and the type of heating plant. To some extent, these improvements have enabled architects to alter the design of structures somewhat. In other respects, perhaps, changes in architectural style have demanded that manufacturers incorporate basic new concepts in their equipment. In addition to this, of course, changing economic conditions have dictated modifications in building and equipment design.

Many Changes Evident

To start with the heart of the steam or hot water heating system—the boiler itself—a quarter century has brought obvious and permanent transformations. Two factors have influenced boiler modification greatly. They are fuel economics and rapid strides in welding techniques. When coal was inexpensive and labor abundant, hand firing was the rule and fuel efficiency was not too important. Chimney smoke was considered a sign of bustle and activity. As civic pressure for cleaner cities brought smoke abatement, so economic pressure brought better firing methods.

Few—if any—engineers in 1929 would have thought of applying mechanical draft to any except large central station boilers. Today, the induced draft fan is commonly used in low buildings to avoid the high chimney. The latter poses an architectural problem when 60 or 70 ft of stack has to hover over a single story building. In finding their solution in the mechanical draft fan, the engineers also found a more economical way to keep gases moving through the boiler.

Package Boilers Developed

Package boilers were just beginning to be heard from, 25 years ago,

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Mr. Steiner is a member of HPAC's board of consulting and contributing editors and has prepared several articles for publication, over a period of many years, on the fuel situation, heating practices and oil burning.

at the exhibitions of new equipment. Quickly there followed the commercial form such as the high pressure steel firetube boiler of a modified scotch marine design, complete with firing equipment, controls, condensate return system, and mechanical draft which was all assembled on a common base, factory wired, ready for setting in place and hooking up to the consumer's power, fuel supply and steam plant. In 1954 the package boiler represents a formidable percentage of total production of both high and low pressure boilers, equipped for firing oil or gas — or both.

Today, the trend is away from masonry settings, which involve certain maintenance costs. In the field of high pressure boilers, there are the scotch, portable firebox, and modified water tube boilers with relatively little masonry in the settings.

Rating Boilers Improved

The past 25 years have brought important developments in the sizing and rating of boilers. The Heating, Piping and Air Conditioning Contractors National Association established many years ago its net load recommendations for heating boilers. The Steel Boiler Institute representing the steel boiler industry, working with the U. S. Department of Commerce, established standard sizes for steel heating boilers, and a standard SBI procedure for rating them. The Institute of Boiler and Radiator Manufacturers, which is made up of manufacturers of cast iron boilers, similarly established an IBR rating code. These rating codes have done much to dispel the confusion that once prevailed in the selection of boiler size.

The typical heating boiler in 1929 was set for hand firing, with a 12 to 15 in. high base. In order to install an oil burner or a stoker, it meant that a pitting job would have to be performed. Gradually, those concerned with specifying such settings — under prompting from the fuel burner industry — began setting the boilers either with pits or high bases, to provide both the clearance needed for the burner mechanism and to create additional combustion volume.

The early installations of commercial oil burners were typically manually ignited and manually controlled. The stationary engineer of those days started the burner motor, lit a torch or handful of waste, placed this igniting device in the firebox and turned on the oil. He then adjusted the feed valve to the firing rate he wanted, and went about his other duties.

Control of Oil Burners

However, as the burner continued firing, the steam pressure would rise, requiring constant vigilance on the part of the engineer. First it was necessary to reduce the flow slightly, then turn it up again. At light load, there was no alternative but to stop the burner, let the pressure fall off, then start up again.

The first improvement on manual control was a means of varying the firing rate in accordance with steam pressure. Then simple safety devices came to interrupt burner operation in event of flame failure, low water, or excessive steam pressure. Of course, the burner always required manual restarting. Automatic ignition finally came along, and the era of modern control opened. Today, electronic supervision of the igniting system and of the main oil flame is common, as well as automatic recycling for low fire start, sensitive variable fire control that responds to minute load changes and sequence interlock of burner firing rate and draft control.

Natural Gas Use Expands

Natural gas by 1929 had been used for some years as a fuel in the areas of origin such as the Southwest and Pacific Coast. The following 25 years saw many pipe lines laid to carry this valuable fuel to many parts of the country. In some metropolitan centers, it is mixed with manufactured gas. In other cases it is put through gas plants and converted to water gas. Also, many distributing companies deliver natural gas straight to the consumers. In industrial plants served by pipe line, natural gas often serves as a standby fuel or is used on an interruptible basis or offpeak basis. Hence, combination gas and oil burner installations are common for plants and buildings desiring a dual fuel arrangement.

Electrical space heating of various types must not be overlooked when modern heating methods are being considered.

Use of Stokers Grows

The nation's principal fuel up to 1929 was of course coal, and when used in heating systems, much of it was hand fired. About that time, however, the stoker began to take a good foothold. During the succeed-

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Two Big Oil Storage Tanks Installed

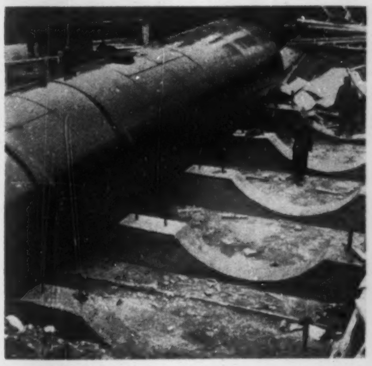
. . . at housing project

TWO OIL storage tanks with a combined capacity of 50,000 gal have been installed at Carver Houses, New York City Housing Authority project along Park Ave. and 98th St.

The 8 ton tanks were lowered into place on special concrete cradles, under the direction of H. Lieblich & Co., Inc., contractors who will install the oil burners to heat the 1800 apartment units.

Each tank is 45 ft long and 10 ft in diameter, will be located in a boiler room of one of the buildings. Each of the other buildings will have a hot water system operated by steam from the central boiler plant.

The general contractor is the Paul Tishman Co. The architects are Kahn and Jacobs. Syska and Hennessey are the mechanical engineers.



ONE OF THE TWO 8 ton tanks, with a capacity of 25,000 gal ing quarter of a century, the underfeed stoker reached a zenith. Meanwhile, the spreader stoker took shape and now looms as a major mechanical coal stoking means for heating plants, and even for fairly large industrial plants short of the central station. The spreader is a simple mechanism, handles a wide variety of coals and responds quickly to load changes. Meanwhile, of course, hand firing has now all but dissappeared.

System Components Change

In the heating system itself, changes as far-reaching as in the boiler room also occurred. Up to 1929, the most common system for commercial heating was the one pipe, gravity return, steam heating system. By that time, however, the vapor plant was the choice where initial investment was not the prime consideration. Larger plants employed vacuum systems, with motor or steam driven vacuum pumps and boiler return pumps. Cast iron standing radiation was the general rule. Schools, auditoriums, banks or structures with large rooms intended to contain many people were heated and ventilated by means of indirect steam coils, often cast iron, installed in ducts over which air was blown and then delivered to the heated space.

In today's heating system, are seen equipment and methods seldom used back in 1929. Forced circulation hot water flows through convectors in cabinets, or through coils in either floor or ceiling panels, or through baseboard radiation. The unit ventilator has taken over much of the job of heating and ventilating, and in many cases of cooling school rooms, auditoriums, public rooms. Architects like floor coils in kindergartens, because the children frequently play on the floor. Gymnasiums can be heated satisfactorily with unit heaters. And the last named device is widely used for heating large spaces such as garages, shops and factories.

In many structures today, cooling poses the principal problems in design, and the air conditioning system is planned primarily from that viewpoint, after which the heating is incorporated into the design. This is understandable, since the ducts that are used for cooling generally are larger than the ducts used only for heating, and the duct distribution for cooling is usually what would be desired for heating.

Controls Have Changed Greatly

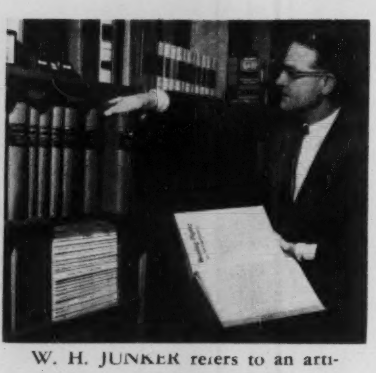
No field of engineering has changed more in 25 years than the application of controls to heating systems. In 1929, many plants had no control whatever. A source of heat and a means of distributing it were together considered a good system. Today, as much thought and planning go into the control of the heating system as into any other aspect. Simple room thermostats prevailed in 1929, and the application of an outdoor bulb was only a novelty. Today the outdoor bulb has a wide application. For 1954 heating, excellent control of air flow has been made possible by the development of damper motor regulation giving sensitive response.

The heat pump presents intriguing possibilities for the future. Up to now, the most extensive exploitation of the heat pump has been on the West Coast and in other areas where winters are mild. Inexpensive electric power will do much to increase the use of the heat pump. No one can say now that nuclear power plants will make power that low in cost, but it sounds interesting.

Even more than either the heat pump or nuclear energy, the solar heat plant looms up to catch the imagination, for here is a vast and almost untapped heat source. Some solar systems have been built, and when the operating and performance data are known and fundamental methods have been worked out, the solar system may progress rapidly. It is too early to say just what will be the principal means of capturing solar energy, but with terrestrial fuels increasing in cost, the sun's rays become increasingly inviting.

All Back HPAC Copies Bound for Reference

. . . by 25 year reader



W. H. JUNKER refers to an article in an old issue of Heating, Piping & Air Conditioning

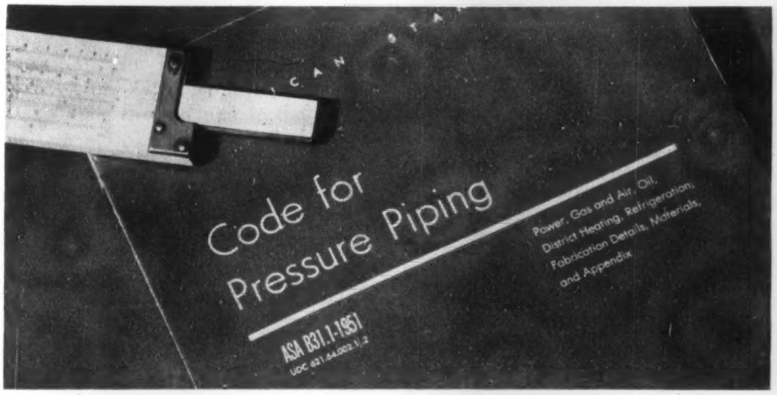
W. H. JUNKER — of Frankenberger, Junker and Lensky, Engineers and Architect, Cincinnati — is one of a group of HPAC's readers who have subscribed to the magazine since the first issue in May 1929. He has his back copies bound for reference, and we asked him to send us the accompanying photo for use in this 25th anniversary issue of HPAC.

"Progress in the field of heating, piping and air conditioning has been well documented in HPAC during the past 25 years," Mr. Junker writes. "Since all my volumes of the magazine are indexed, I find myself referring to them to ascertain how other engineers solve various problems, and to keep abreast of research in the ASHVE Journal Section.

"The past 25 years have brought great strides in the use of unit heaters, convectors and baseboard radiation, together with panel heating and forced water systems for both heating and cooling," he continues. "Since World War II, packaged boilers and air conditioners have been growing in volume and people are more conscious of automatic controlling devices. Air conditioning has progressed greatly.

"During the next 25 years, progress in the art of providing comfort conditions for human occupancy may involve even better air distribution, higher air velocities in central duct systems, extensive use of acoustical and insulating materials, and more prefabricated equipment and packaged units," he says.

Mr. Junker has had a wide experience in the design of air conditioning, heating and ventilating systems for many buildings, including the Carew tower and Netherland Plaza hotel, the Cincinnati & Suburban Bell Telephone building, the Cincinnati Street Railway Co. shops, and others equally well known.


Code for Pressure Piping
Power, Gas and Air, Oil, District Heating, Refrigeration, Fabrication Details, Materials, and Appendix
ASA B31.1-1951

The Code for Pressure Piping

.. its development and importance reviewed

By F. S. G. Williams
Sectional Committee Chairman on Code for Pressure Piping B31

THE NEED for a national code for pressure piping became increasingly evident from 1915 to 1925. To meet this need, the American Standards Association initiated project B31 in March 1926 at the request of the American Society of Mechanical Engineers, with that society as the sole sponsor. After several years of work by sectional committee B31 and its subcommittees, a first edition was published in 1935 as a tentative American Standard Code for Pressure Piping.

Code Made Standard in 1942

A revision of the original tentative standard was begun in 1937. Several more years' effort was devoted to securing uniformity between sections and to eliminating divergent requirements and discrepancies as well as to keeping the code abreast of current developments in welding technique, stress computations, and reference to new dimensional and materials standards. During this period, a new section was added on refrigeration piping, prepared in cooperation with the American Society of Refrigerating Engineers and complementing the American Standard Code for Mechanical Refrigeration. This work culminated in the 1942 American Standard Code for Pressure Piping.

Supplements 1 and 2 of the 1942 code, which appeared in 1944 and 1947, respectively, introduced new dimensional and material standards, a new formula for pipe wall thickness, and more comprehensive requirements for instrument and control piping. Shortly after the 1942 code was issued, procedures were established for handling inquiries that require explanation or interpretation of code requirements, and for publishing such inquiries and answers for the information of all concerned.

Committee Reorganized

Continuing increases in the severity of service conditions, with concurrent developments of new materials and designs equal to meeting these higher requirements, had pointed the need by 1948 for more extensive changes in the code than could be provided by supplements alone. By that time also, the then existing personnel of sectional committee B31 was in need of reorganization to fill vacancies and to replace with new blood those members whose interests had changed over the years. During the first 20 years of its existence, the sectional committee retained much of the same personnel and operated with a definite continuity. By 1948, however, it became apparent that the old membership had in part disappeared or was out of touch with developments in this field. The decision was therefore reached by the ASA and the sponsor to reorganize the sectional committee and its several subcommittees, and to invite the various interested bodies to reaffirm their representatives or to designate new ones.

Because of the wide field involved, some 30 to 40 different engineering societies, government bureaus, trade associations, institutes and the like appointed one or more representatives to serve on the sectional committee, plus a few "members at large" to represent general interests. In addition to active voting members on subcommittees, there are several "corresponding members" who receive mailings and who are urged to comment if they so desire. Code activities are subdivided according to the scope of the several subcommittees and sections of the code. These, with the subcommittee chairmen who are now serving, are shown in the accompanying listing. General direction of code activities rests with the sectional committee officers and an executive committee, whose membership consists principally of sectional committee officers and section chairmen.

Following its reorganization in 1948, sectional committee B31 made an intensive review of the 1942 code which resulted in: (1) a general revision and extension of requirements to agree with present day practice; (2) the revision of references to existing dimensional standards and material specifications and the addition of references to new ones; and (3) the clarification of ambiguous or conflicting requirements. A revision was prepared which was presented for letter ballot vote of sectional committee B31. Following approval by this body, the project was next approved by the sponsor organization and by the ASA. It was finally designated as an American Standard in February 1951, with the designation B31.1-1951.

Early Piping Advances Cited

Many advances in piping practice have come about since the ASA Code for Pressure Piping, B31, was issued first as a tentative American Standard. Some of the principal developments pointed out in the introduction to the revised code which came out as the American Standard after six years of seasoning are listed below.

Welded joints assumed an increasing importance, standard dimensions had been prescribed for factory made, butt welding and socket welding fittings and their use became common practice, welding end valves with welded bonnets were developed and adopted, rules for reinforcing welded branch connections and for designing welded or cast specials were added, rules were added for combining expansion stresses with those due to internal pressure, new rules were formulated for the qualification tests of welding processes and welding operators, pressures and temperatures were advanced to new highs, new material specifications and dimensional standards were formulated, and a section on refrigeration piping was added in keeping with the growing importance of this industry in air conditioning as well as in older lines.

Supplement No. 1 Issued

Following the publication of the 1951 edition of the Code for Pressure Piping, the committee that had been working jointly with the ASME Boiler Code Committee and ASA sectional committees B16 and B36, recommended a revised basis for establishing allowable stresses for certain materials common to the several codes and standards. In order to put these revisions in the hands of code users, sectional committee B31 voted to approve the publication of the 1953 supplement, pending a revision of the entire code which is expected to be completed in 1955.

SECTIONAL COMMITTEE ON CODE FOR PRESSURE PIPING B31

Officers of Sectional Committee

F. S. G. Williams, Chairman
Sabin Crocker, Vice Chairman
L. W. Benoit, Secretary

Chairmen of Subcommittees	Section and Subcommittee
E. J. Wiseman	Section No. 1 on Power Piping
H. A. Clarke	Section No. 2 on Gas and Air Piping for Industrial Installations
W. D. Kinsell	Section No. 3 on Oil Piping
G. D. Winans	Section No. 4 on District Heating Piping Systems
A. C. Buensod	Section No. 5 on Refrigeration Piping
K. W. Haupt	Section No. 6 on Fabrication Details a) Fabrication of Pipe Hangers, Supports, Anchors, Sway Bracings, and Vibration Dampers b) Fabrication of pipe joints other than welded c) Expansion and Flexibility d) Welding of pipe joints e) Welded branch connections and fabricated or cast specials
L. W. Kattelle	Section No. 7 on Standards and Identification
F. A. Hough	Section No. 8 on Gas Transmission and Distribution Piping
J. J. Kanter	Section No. 9 on Materials and Stresses
R. E. Sprenkle	Section No. 10 on Instrument Piping
C. A. Kelting	Section No. 11 on Liaison
D. G. Reid	Coordinating Subcommittee

The revised provisions contained in the supplement were submitted to the sponsor and following approval were presented to the American Standards Association. This supplement was approved by the ASA under date of April 30, 1953 with the designation B31.la-1953, Supplement No. 1 to B31.1-1951. This supplement contained new tables of stresses for the power, district heating and oil refinery sections. The new formula for pipe wall thickness which had been adopted earlier also appears in this supplement.

In November 1951, sectional committee B31 authorized the consolidation of those sections of the code (B31.1-1951) dealing with gas transmission and distribution piping into a separate integrated document. This consolidated document is known as Section No. 8 of the code, published in September 1952. Section No. 2 of the code has been rewritten to cover only gas and air piping for industrial installations in the next edition of the code, together with Section No. 8.

Purpose of Code Reviewed

While the code is used extensively in construction contracts as a reference base for minimum safety requirements, its principal purpose is to serve as a guide to state and municipal authorities, in case they should decide to adopt such regulations. In such cases, however, the code provides that it shall *not* be made retroactive or construed as applying to piping systems erected before, or under erection at the time of, its approval by the ASA. The code also serves as a standard of reference for minimum safety requirements by equipment manufacturers, architects, engineers, contractors and others concerned with pressure piping.

In each field of piping covered, the code provides a standard of minimum safety requirements for: (1) the selection of suitable materials and reference to standard specifications by which they may be secured, (2) the designation of proper dimensional standards for the elements comprising piping systems, (3) the design of the component parts as well as the assembled unit, including necessary supports, (4) the erection of these systems and (5) the test of the elements before erection and of the completed systems after erection. It is intended to set minimum safety requirements expressed in language which is intelligible to all who design, manufacture and erect piping systems, but not necessarily to cover the best practice known to the art. While in most cases the requirements are mandatory, design recommendations have been included where they will be of assistance in securing safe piping systems.

The Recent Past and Future

The latest developments regarding the code as well as the plans for future considerations are also worthy of mention here. The committee made it permissive to use the new pressure-temperature ratings in ASA

B16.5 which are applicable to steel flanges, flanged fittings and valves, when Case No. 15 was just recently issued. This new case interpretation is explained further later in the present article.

Section No. 8 on gas transmission and distribution piping has been under active revision work since July 1952. The subcommittee has made good progress, and it is hoped that the revisions will be completed and approved in 1954.

Subcommittee No. 6 on fabrication has been very active since November 1953, and it is expected that the revisions to this section of the code will be extensive.

The "task force on flexibility" has completed its assignment with the presentation of a report that has been unanimously approved. Considerable publicity was given to the first report of the committee, and over 600 copies were distributed throughout the engineering profession by the American Society of Mechanical Engineers (also published in November 1953 HPAC.) The comments received by those reviewing this report have been carefully assembled and the task force committee submitted a final report, which has been approved for adoption and publication. Anyone interested in obtaining a copy of this final report may do so by writing to the American Society of Mechanical Engineers. The bases for these new rules are given in ASME paper 53-A-51 by A. R. C. Markl, entitled *Piping Flexibility Analysis.*

The task force on flexibility has also received approval of its report dealing with the physical constants of piping which are required for analysis of flexibility problems. These have been approved, and the new tables will appear in the next revision of the code. The new values were presented in ASME paper 53-A-52 by Rudolph Michel, entitled *Elastic Constants and Coefficients of Thermal Expansion of Piping Materials Proposed for* 1954 *Code for Pressure Piping.*

The American Petroleum Institute has recommended to the committee that a separate section of the code be formulated applicable to oil transportation piping. This recommendation was approved by the committee, and will get underway shortly.

The ASA chemical industry advisory board recommended to the sectional committee that a separate section be created for chemical industry process piping. This recommendation was approved and a new subcommittee is being organized to undertake the assignment.

It had been planned to publish a revision of the code in July 1954, but in view of the substantial volume of revisions that have been proposed, it has been decided to defer the publication date of the new issue of the code until early in 1955. This schedule will permit the inclusion of all revisions now in process and the new edition will therefore be of much greater usefulness to all concerned.

Revisions and Interpretations

Sectional committee ASA B31 has established an orderly procedure to consider requests for interpretations and revisions to the code rules. Inquiries must be in writing and must give full particulars in order to receive consideration.

Requests for interpretations or for changes in the code for clarification can usually be acted upon promptly. Requests for basic changes in the code or questions that disclose the need for basic changes require more time.

The "Case Interpretation"

When the approved reply to an inquiry involves a change in the code rules, the ruling is made public through the issuance of a "case". This is published in *Mechanical Engineering* and issued to all subscribers of the ASME Piping Code Interpretation service. Other items involving revisions are usually handled on the basis of issuing revisions to the code once each year. Suggestions for revisions may originate within the committee itself or from anyone outside the committee.

All requests for interpretations or suggestions for revisions should be addressed to the Secretary, ASA Committee B31.1, 420 Lexington Ave., New York 17, or to that committee in care of the American Society of Mechanical Engineers, 29 W. 39th St., New York 18.

The ASME maintains a revision and interpretation service pertaining to the Code for Pressure Piping. The current annual fee is $2, and it is recommended that users of the code subscribe to this service as an effective means of keeping up-to-date.

As mentioned previously, a recent case interpretation has just been issued which is included here. Previous case interpretations have appeared in HPAC from time to time as soon as they have been made available, through the courtesy of the ASME and the code committee.

Case No. 15

Question: May the new ASA B16.5-1953 pressure-temperature rating tables be used in the various sections of the Code for Pressure Piping where reference is now made to the applicable American Standard or to ASA B16?

Answer: It is the committee's opinion that pending the new edition of the Code for Pressure Piping, the pressure-temperature rating tables in ASA B16.5-1953 may be used for all sections of the code.

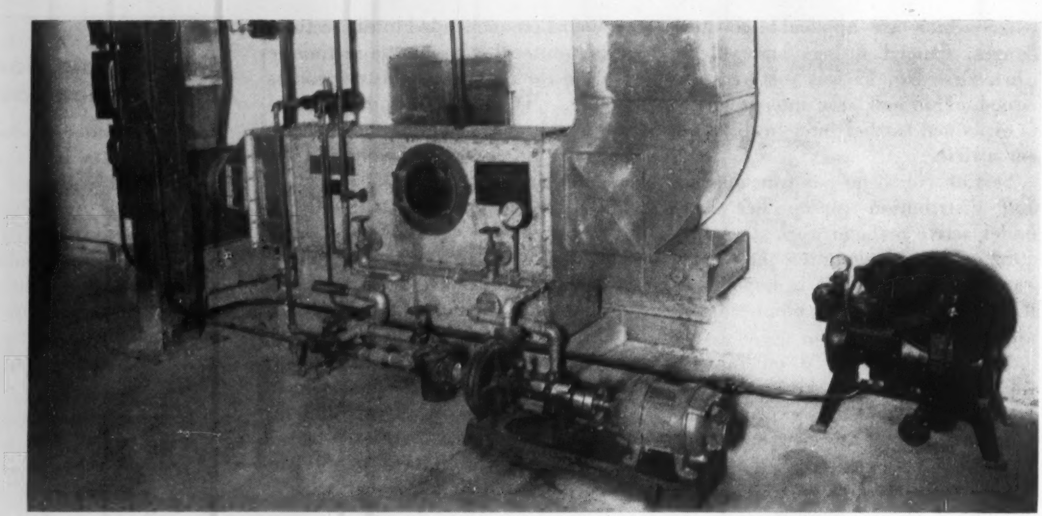
Philadelphia Has New Air Pollution Law

. . . Includes odor control

PHILADELPHIA has a new air pollution control ordinance that is stronger than its predecessor. It makes specific definitions of air pollution types and the air pollution nuisance to health and well-being and makes unique provisions for the important problem of controlling odors. In addition, it defines equipment covered by the ordinance.

The new law prescribes fees for permits, calls for an increase in penalties for violators and gives the city's department of health and the air pollution control board stronger enforcement as well as administrative powers.

S. Charles Rothmann, recently appointed director of the health department's air pollution control division, points out the division's program will continue to emphasize (1) elimination of open dump burning when incinerators are completed; (2) increased industrial "cleanup" activities, and (3) an automatic and fair enforcement policy.



BOTH THE ART of air conditioning and the desire of people to enjoy it have advanced in the past 25 years. Here's a 1929 industrial installation which is still in use today

Air Conditioning Has

WALTER L. FLEISHER has been a member of HPAC's board of consulting and contributing editors since the first issue in May 1929. He also contributed the first article in that issue on the subject of air conditioning. He is a past national president of the American Society of Heating and Ventilating Engineers, and was awarded in January the ASHVE's F. Paul Anderson medal in recognition of his outstanding contributions to the advancement of heating, ventilating and air conditioning

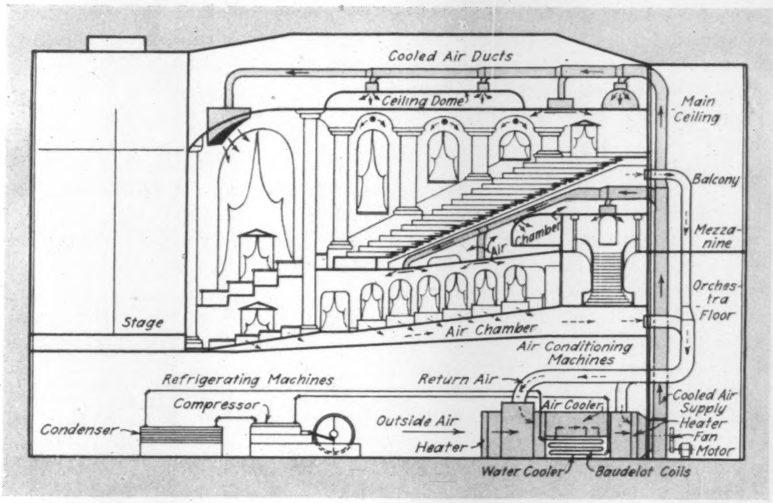
By Walter L. Fleisher
President, Air and Refrigeration Corp. and Consulting Engineer

THE ART of air conditioning has advanced in the past 25 years as much as the desire of people to have it. When my article *Air Conditioning — Its Development in Industry* was written for the first issue of HPAC in May 1929, only a few of us knew as much about air conditioning as is known today by a great many. Of course, one of the main factors responsible for this rapid development is the demand psychology that has grown since air conditioning has become economically feasible.

Centrifugals an Advancement

A few basic developments have had a great deal to do with the expansion of air conditioning. One of these is the centrifugal refrigeration compressor, which in a small space can develop at high speed a large amount of refrigeration capacity. In 1929, except for one type of centrifugal compressor, all others being used for air conditioning were slow speed units or CO_2 compressors with their critical temperatures and their large condensers.

The centrifugal compressor itself was dependent on a new refrigerant which could be used to great advantage with a high speed machine and was non-toxic. This allowed the direct connection of high speed motors or turbines, which simplified and reduced the size of the driving mechanism. The machine that was developed for this particular purpose was



THEATERS WERE EARLY users of air conditioning to provide relief from the summer heat. Here is a schematic cross section of a theater — built in 1929 — showing the air conditioning equipment and air distribution system

Developed Rapidly

actually a high pressure, high speed blower utilizing a suitable refrigerant in place of air. The next development of this kind was a high speed centrifugal compressor using water as a refrigerant, which was not too successful and has now become obsolete.

The development of "Freon" probably was the most important of all the discoveries leading to the growth of air conditioning. It not only made the centrifugal compressor possible, but without a refrigerant of this type, none of the small units now in use could be practically possible.

Basic Principles Not New

Another development that has taken place during the last 25 years in air conditioning large buildings is the use of central high pressure units. In this system, air from a central unit, after being cooled, is delivered under pressure to secondary heat transfer coils containing either hot or cold water and then to the supply outlets. Because of the high pressure of the supply air, room air is mixed at the outlet to result in the air conditions desired.

As early as 1928, Smith, Hinchman and Grylls, consulting engineers, designed systems for office buildings in which conditioned air was delivered through the beams at high pressure and the velocity was reduced at the outlets. These represented, perhaps, the first high pressure systems, in my opinion.

There are several old patents covering the introduction of a small amount of highly conditioned air delivered at high pressure to a series of distribution points where, either by induction or by use of a fan, other air in larger quantities and different temperatures is recirculated. In my opinion, these are similar to the methods now in general use in the peripheral systems found in many large buildings.

The general use of induction supply outlets, where low temperature air induced recirculated air to produce comfortable temperatures, was also a great advance, as they reduced the amount of air that had to be returned to the central system. These were in general use as early as 1920. I simply mention this to indicate that the basis of modern air conditioning in the last few years has not greatly changed, but the demand which has been created over the last 25 years has led to many improvements in the basic apparatus which produces the conditioned air, and in particular to the adaptation of compressors to the use of modern refrigerants.

Window Unit Development

In 1929 there probably were 20 million automobiles in general use. Today there are probably 55 million, just to give an idea of the growth of luxury products in the last 25 years. The refrigeration division of one large corporation was just beginning to manufacture a room cooling unit in 1929. Last year there were many thousand window units sold which are pleasant in appearance, effective and economic in operation, and sell for an average price of between $300 and $400 per unit—whereas the unit manufactured in 1930 cost about $800. Now, the demand for such a cooling unit is so great that it is expected by some that 1½ million may be sold this year. In 1929, two or three manufacturers were building a small unit for the individual room. Today, there are between 65 and 70 sources of supply, and the number is increasing day by day.

Today, there are two great movements which are predicated on small and effective refrigeration units. One is the year 'round air conditioning unit which has caused wide acceptance of the forced warm air method of residential heating. As the circulation of cool air requires a duct system, the warm air heating system has become common when combined with a refrigeration unit to provide cool air in the summer. Residential year 'round air conditioning, of course, has put emphasis on air cleaning and air circulation, including electrostatic dust and smoke elimination.

In this connection, the heat pump has also become popular in the last 10 years where refrigeration equipment utilizing the outside air or the earth's heat is being used in the winter for heating and in its normal operation for cooling in the summer. This type of system has possibilities in the milder climates where winter conditions are not too severe for the unit to perform its winter function.

Advancements in Industry

Most of the discussion thus far pertains to the comfort of people. As mentioned previously, my article in the first issue of HPAC was entitled *Air Conditioning — Its Development In Industry*.

What about the development of air conditioning in industry during the past 25 years?

In 1929, air conditioning with refrigeration was being used in the synthetic fiber industry — such as rayon and celanese — and the accompanying plastic industries. The film industry, for instance, used air conditioning as early as 1919 or 1920 for many purposes, such as film drying and washing, film printing and perforating in order to eliminate production problems. Another example of early air conditioning being used in an industry was the application in the Smith Bros. cough drop factory in 1918, designed by myself.

The great changes that have been made in industrial air conditioning may be attributed to the increased demand for comfort to which all of us have become accustomed. In other words, progress has been made from the stage where only air movement or ventilation was considered good enough for the worker. One step in this advancement was through the worker's suggestion that he be entitled to evaporative cooling for comfort. With increased manufacturing activity in the last few years, a scarcity has been created in the labor market, making it essential to lure the worker from one plant to another where conditions are better. Thus, the manufacturer can justify the introduction of air conditioning on the basis of more production at lower cost as a result of better worker morale and performance. During the second World War, the government paid for most of the luxuries that were put in the factories with the idea of getting increased production, and it became a fairly general practice for new industries to include air conditioning in their plans.

A.C. Essential in Textiles

In these past 25 years, there has been a trend of the textile industry to migrate from New England to the South and to use air conditioning in all phases of manufacturing synthetic textiles from thread to weaving. Also, the concentration of power in the manufacturing process is great, which has emphasized the need for heat relief for the workers. In addition, as most textiles are manufactured under high humidity conditions, this poses another requirement for the comfort of the worker. In many instances, the owners of textile mills have installed deluxe air conditioning systems as well as complete ventilation to maintain the morale essential to economic production under these environmental conditions.

Office Building Acceptance

I can hardly think of an office building of major importance built within the last 10 years that does not include complete air conditioning. This has imposed, on the owners of old office buildings, a problem of tremendous importance because the addition of air conditioning into existing buildings of any size is expensive. Tenants seem to be willing to move into new buildings in which charges from $1.50 to $3.00 per sq ft are included in the rental rate to cover the cost of air conditioning. However, the occupants of existing office buildings sometimes balk when faced with an increase of $2.00 to $3.00 per sq ft for the introduction of air conditioning, and migrate to newer buildings in which air conditioning is being or has been installed and where this cost is already part of the rental.

Most of the hospitals which are being built have incorporated air conditioning in certain areas, particularly the operating rooms. The research divisions of both privately owned corporations and the government have required a great amount of special air conditioning involving low pressures, very low temperatures or the combination of these items with many other factors which have created a new field for air conditioning.

Theaters Early Users

The moving picture theaters were early users of air conditioning to provide comfort to their customers while being entertained. They alone claimed to provide the only cool spots from summer heat — and justifiably so. Now, they are giving way to comfort air conditioning in the home together with a television set. Maybe television in the home is responsible for the tremendous influx of air conditioning in the home, and the moving picture theaters will have to find another "lure".

Comfort in Transportation

Today, as you know, no one would ride in a train unless it is air conditioned. Yet it was only about 20 years ago that the Baltimore & Ohio was accepting bids to be the first to air condition their cars. Also gaining in popularity is the air conditioning of automobiles. The advent of air travel has created a new application and a new field for air conditioning which has been brought about to a certain extent by the pressurized chamber of the airplane and by the change in temperatures between the ground and the upper stratosphere.

Future Considerations

Sterilization of the air by means of special devices incorporated into air conditioning systems has also been carefully investigated over the past 25 years. This is still an important question and one that will undoubtedly receive much more careful consideration in the next 25 years.

There is no question that the great increase in air conditioning from a meager $10, $15 or $20 million business in 1929 to the $1, $1½ billion or more business that it is today shows that we have gone a long way. However, there is by no means complete unity of opinion as to the proper methods or the proper design of air conditioning systems for all applications. The field is wide open and the happy genius who can satisfy the individual rather than the multitude has a great future in this art of air conditioning.

Much Still To Be Done To Solve the Air Pollution Problem

By R. S. Hawley

Professor Emeritus of Mechanical Engineering
University of Michigan

PROFESSOR HAWLEY has been a member of HPAC's board of consulting and contributing editors since the first issue in May 1929. He has gained wide experience as a consulting engineer in the heating and industrial fields and has been a professor of mechanical engineering at the University of Michigan since 1917, serving as department chairman from 1940 to his retirement in 1951

AT THE BEGINNING of the present century, there was a westward movement of rapidly expanding industries accompanied by the burning of huge quantities of fuel in large industrial centers. This brought about an atmospheric condition that demanded attention. As a result of investigations made at that time, a few of the larger cities adopted ordinances for the reduction or abatement of smoke. These ordinances included such features as the appointment of a smoke inspector or the organization of a smoke department, a means of determining smoke density and the establishment of penalties for violation of the ordinance. Later ordinances included the requirement of a permit from the inspector before a new or remodeled plant could be put into operation.

Progress Was Slow

Due to the many complications involved in the enforcement of these ordinances, progress in smoke abatement was slow, but gradually — through the cooperative efforts of the manufacturers of fuel burning equipment, engineering societies, research organizations and leading citizens in many communities — the idea has spread until today many cities with populations as small as 15,000 to 20,000 have adopted smoke abatement ordinances which are being effectively enforced — sometimes by only a part-time inspector. In this connection, it might be well to mention the influence of public opinion on the enforcement of this type of ordinance. In smaller communities which cannot afford to employ a smoke inspector, a group of interested citizens working through schools and social clubs can produce astounding results in smoke abatement.

Perhaps the most important single factor in the development of smoke abatement enforcement was the improvement made in mechanical devices for burning solid fuels. Only 50 years ago, most furnaces, both large and small, were fired by hand. Today the mechanical stoker and pulverizer is the accepted device wherever solid fuels are burned. Furthermore, if properly installed, practically all mechanical firing devices can be operated with a minimum of smoke, well within the limits specified by any reasonable smoke abatement ordinance.

Industrial Processes a Factor

Although much has been accomplished, there is still a great deal of work to be done, particularly in educating the public to appreciate the advantages of a clean atmosphere.

Gases and fumes discharged into the atmosphere from chemical plants and industrial furnaces also may create a problem in air pollution, and it is one which is usually more difficult to solve than that of smoke abatement. Smoke is visible, while gases (as a rule) are not. Yet, unless discharged into the atmosphere at elevations well above the surrounding area, they can cause serious damage to vegetation and also constitute a health menace. It is difficult to enact legislation to cover this type of problem, since no two plants present quite the same conditions. One solution seems to be the use of tall stacks or chimneys so that the discharged gases will be diluted to a point where their detrimental effects are removed.

Closely allied to the above problem, but entirely different in the source, is the possibility of air contamination by the exhaust from motor vehicles. This has become a matter of some concern in large cities with tall buildings and relatively narrow streets. Analyses of air samples made in some congested areas have indicated the presence of carbon monoxide gas in percentages too high for healthful conditions. Just how serious this question is remains to be determined through further study, and we may expect to see increased activities as far as investigations of atmospheric conditions in large cities are concerned during the next few years.

Warm Air Heating's

. . . growth and application outlined

By E. B. Langenberg
Consulting Engineer

MR. LANGENBERG was the author of an article in the first issue of HPAC which described a warm air heating installation in a large church. We asked him to say something about developments in the warm air method of heating for this anniversary issue. He comments here on the growth and application of warm air heating in larger buildings.

WHEN BENJAMIN FRANKLIN put the first jacket around a hot stove, little did he probably realize that a century and a half later his air heating system would come into such wide use. His primary purpose in designing this first direct fired air heater was to provide more efficient heating. His heating unit — commonly referred to as the "Franklin stove" — was a combined convection and radiation heater with a closed-in fire. Franklin even published an essay about this improvisation and its allied components and entitled it Smokey Chimneys. The Franklin stove was used for many years, and then it was moved to the basement to get it out of sight and to conserve floor space.

Pipeless Furnace Born

In moving the stove to the basement, the pipeless furnace was born. The results experienced with the pipeless furnace were by no means ideal in maintaining uniform temperatures in heated spaces of certain types such as stores, churches, industrial plants and other buildings with relatively large open areas, but it was a definite improvement over the stove. The direct fired units used with this gravity flow system were limited in their application, but by the use of multiple units, the method was used extensively in the large open types of structures. The distinguishing feature of the pipeless furnace was its casing, which was usually a double one with a duplex register in the floor directly above the furnace. The heated air was discharged through the center of the register, and the cool air entered the outer ring of this large register from the floor, dropping down between the casings to be reheated. It was with this heating system that the direct fired and air heating industry first received the name of "hot" air. However, this name was soon to be changed.

Warm Air System with Ducts

It was not too long until it was discovered that round ducts could be installed to deliver the heated air to other areas than those just above the furnace. Of course, the distribution system using ducts provided more uniform air temperatures in the heated space and at the same time the temperature of the circulating air was reduced, so that the term "hot" air was changed to "warm" air.

Like the pipeless furnace system, this gravity warm air system was limited in application, but not as much of course. However, by using two or more individual systems in a structure, the method became popular in heating schools, churches, industrial plants and public buildings.

Furnace Rating Early Problem

At this time, it was realized that the performance of the gravity heating system was largely dependent upon the the design and installation of the air distribution system. Another basic problem which confronted the warm air heating industry was the matter of rating the gravity warm air furnace. Through the efforts of Dr. A. C. Willard, then professor of heating and ventilation at the University of Illinois, the warm air heating industry joined together to form the National Warm Air Heating Association in 1914. At this time, gravity warm air furnaces were rated by their weight in pounds of cast iron rather than by their heat output, but Professor Willard felt that this method was faulty — as the weight and heat output of the furnace were not directly related. Therefore, he proposed that a research program be sponsored that would help to correct this situation and suggested that a cooperative agreement be made between the University of Illinois engineering experiment station and the association. This cooperative contract was made in 1918, which enabled the warm air heating industry to begin its attack on this problem.

It was recognized as early as 1920 that *one* method of design and installation of the heating system was essential if satisfactory heating results were to be achieved. Also, the warm air heating industry realized that by making one standard design and installation procedure available, the valuable results of the research conducted could best be disseminated in workable form. Therefore, the first edition of the *Standard Code* was published in 1921 — its objective was to regulate the installation of gravity warm air heating systems. Subsequently revisions were required as more information was developed.

Manual for Large Buildings

After the forced air heating system had reached the stage of development where a design and installation manual could be made available, members of the installation code committee of the association met and, after a great amount of work, the manual for this system was published. Later in the '30's, it was felt that the installation of warm air heating systems in large buildings should be guided by a manual. This was published as Manual No. 9 and entitled *Technical Code for Warm Air Installations in Large Buildings.*

The development of these manuals was not an easy task. It was necessary that every manufacturer of warm air heating equipment be reached in the early stages of the development. This was important because, first, there were nearly as many design and installation methods as there were heating contractors and manufacturers. It was the contractor who was burdened with too many different sizes of registers, ducts, fittings, filters and blowers. Of course, it was only the manufacturer that could help to correct the situation. Since each of the component parts of the warm air heating system was closely related, a standard design and installation procedure could not be adopted, or the sizes of the various parts could not be standardized without the approval of all of the manufacturers of each of the component parts.

The task of contacting about 200 men in the industry by correspondence and in person was a tremendous one. Dozens of meetings and conferences with the manufacturers of registers, fittings, controls, blowers, filters and many others produced a flood of suggestions and ideas. The best ideas and suggestions were then boiled down to form the nucleus of the movement.

A committee of 15 men from industry — known as the Installation Code Committee — was appointed to phrase and actually write the manuals. These standardized methods of design and installation could not be one company's method or cover the individual preferences of one or even a small group.

Much data has been gathered in the 35 years of continuous operation of this research program in the laboratories and other facilities available for studying furnace performance, rating methods in terms of heat output, air temperature drop in ducts, methods of control, fuels, weatherproofing the structure, air distribution and overall efficiency of the system. Of course, in this 35 year period, the forced air heating system came into its own in the late '20's and early '30's, as did the art of air conditioning. Thereupon, the name of the trade association was changed to the National Warm Air Heating and Air Conditioning Association.

Warm air panel heating was being explored both in the floor and in the ceiling early in the '40's. In the late '40's, the warm air perimeter system was developed especially for heating the basementless type of structure, whether it be a church, school, factory or other structure.

DR. A. C. WILLARD, former professor of heating and ventilation, and later president of the University of Illinois, now emeritus, was responsible for the initiation of the cooperative warm air heating research program that began in 1918. Dr. Willard is a past president of the ASHVE and has written many articles and textbooks on heating, ventilation and air conditioning

Application Continues to Grow

Today, the application of forced warm air heating is continuing to grow in the field of commercial, industrial, institutional and public buildings. There are a number of basic reasons why the forced air type of heating system is finding wide application in such large buildings. Perhaps the most important is the matter of ventilation. Many states and municipalities have in recent years incorporated minimum quantities of outdoor air that must be introduced into the heated space, such as in schools and in other places of assembly.

Another factor is the flexibility or responsiveness to the demand for heating. This flexibility offers an advantage for the user who prefers to reduce the air temperature and heat up quickly. Of course, there are other features also which have been accepted as advantages, such as filtered air, air motion within the heated space and humidity control.

Perhaps the fact that the air distribution system used for warm air heating can also be used for air conditioning is one of the most important considerations. So is the availability of furnaces and heaters that may be suspended from the ceiling, installed in closets for delivery of the warm air to subfloor ducts, and compact units that can either be installed in the heated space or in the basement.

To Give Peacetime Atomic Power Picture

. . . at laboratory dedication

A NEW RESEARCH and testing laboratory tripling The Trane Co.'s experimental and product development facilities will be dedicated at La Crosse, Wis., May 20, 22 and 23. A nationwide broadcast on peacetime atomic power by a world leader in this field headlines the affair.

The laboratory is devoted to heat transfer problems — including heating homes, cooling jet planes, air conditioning skyscrapers, providing heat exchangers for atomic plants, etc. — D. C. Minard, Trane president, points out.

Robert LeBaron, Assistant to the Secretary of Defense (Atomic Energy) and chairman of the Atomic Energy Commission's military liaison committee, will talk on peacetime atomic power before a limited number of invited guests at a May 20 dinner in the laboratory. His talk will be broadcast by CBS.

Industrial Hygiene Comes of Age

. . . In The Last 25 Years

By Herbert T. Walworth
Director of Industrial Hygiene
Lumbermens Mutual Casualty Co.
and President, American
Industrial Hygiene Association

TODAY, INDUSTRIAL HYGIENE provides important technical contributions to the success of industry. Twenty-five years ago industrial hygiene was only vaguely understood, and industry in general was reluctant to accept this activity as a necessary part of its operation. Many found it difficult to realize that the engineering and chemical professions could contribute materially to the solution of health problems which were generally believed to fall into the realm of the medical profession.

Activity Begins to Expand

While industrial hygiene had been practiced on a limited scale, it was not until the late '20's that a few pioneers gave impetus to a promising technical field by enlisting the aid of professions other than medical in the control of occupational disease hazards. The early years of industrial hygiene development were not free of rivalry. This rivalry frequently developed into controversy principally among the physicians, chemists and engineers. As time went on, it became evident that only through close cooperation could the job be done effectively and to the greatest benefit of the worker and the employer. Now, American industry is aware of the benefits of increased production and better employee relations which can be derived from environmental health programs. Often, industry needs only technical assistance and guidance in such program application.

Throughout the early development of industrial hygiene, there was a recognized need for better understanding of this field among heating, ventilating and air conditioning engineers and contractors. While much progress has been made in these past 25 years, it is believed that it is both desirable and logical that advancements will continue to be made in this area during the years to come.

History and Growth

Industrial hygiene had a humble beginning. The profession grew out of the silicosis problems in metal mining and in the foundry industry. Later, it was expanded to include the control of lead and other metal poisonings, of infra-red, ultraviolet, radiant heat, radioactivity hazards and to other common industrial health exposures. With the growing importance of loss of hearing as a potential compensation matter, the problem of industrial noise and its control has also been given to the industrial hygienist for solution.

Industrial hygiene has become an integral part of the atomic energy program. Recent developments indicate that the atomic energy program may soon be expanded to involve private industry. When this fully materializes, the industrial hygiene profession will then cope with the new problems presented. Development and growth of the chemical industry, with the almost continuous flow of new chemicals to all types of industry, has further stimulated the growth of industrial hygiene according to the basic principle of anticipating and controlling harmful exposures before injury results.

It is not surprising that the early history of industrial hygiene closely followed the passage of state occupational disease laws. These laws created the demand for health standards and prompted industry to seek technical assistance in controlling silica dust hazards, and later other harmful health exposures. As the silicosis problem was brought under control, industry began to recognize the need for a positive approach to its health problems rather than attempt to mend its fences after the damage had been done.

Practically the only periodical carrying technical articles on industrial hygiene in the 1920's was the *Journal of Industrial Hygiene and Toxicology*. This journal is now known as the AMA *Archives of Industrial Hygiene and Occupational Medicine*. The Harvard School of Public Health was the only university at that time offering courses in this field. Now, courses are offered at the University of Pittsburgh, University of Michigan, Johns Hopkins University, University of California and other public health and engineering schools.

The American Industrial Hygiene Association was organized in 1939 to encourage the exchange and dissemination of information in engineering, chemistry, physics, medicine, toxicology and other basic sciences as they apply to industrial hygiene. At the time of its first annual meeting in 1940, the association's membership was 160. Since then it has experienced a steady growth and now it has more than 1700 national and local section members throughout the U. S. and Canada. Its membership is comprised of persons having training in the sciences mentioned above, who are employed in a wide variety of organizations representing industry, government, labor, insurance and education. Twenty local sections function actively in various areas throughout the U. S.

The official publication of the Association is the *American Industrial Hygiene Association Quarterly*, which carries both scientific papers reporting the results of original research, and articles of general interest. Development of the industrial hygiene field has centered around AIHA and now emerges as a recognized scientific profession.

Industrial Hygiene Services

The principal industrial hygiene activity in government is in the U. S. Public Health Service and the various state health departments. In a few states, this activity is a function of state departments of labor. During World War II, the Army, Navy and Air Force supported industrial hygiene programs in government operated plants and other installations. These activities continue at the present time but on a reduced scale. Also, during World War II, the U. S. Public Health Service expanded its activities and, in addition, loaned personnel to other organizations wherever critical shortages developed. Following the war, industry absorbed most of these trained industrial hygienists, leaving many of the governmental organizations with only skeleton staffs. Large numbers of industrial hygienists and health physicists continue to be employed in atomic energy installations.

The development of interest in industrial hygiene by industry has been gradual. This was the cause of considerable concern in the 1930's, but now there is little question of its acceptance by industry and the gradual and continuous growth is considered a healthy sign. In addition to the employment of industrial hygienists for plant health maintenance, the chemical and other industries have developed toxicological research programs for the purpose of testing products before marketing to other industries or the public.

Compensation insurance carriers — and life insurance companies, to a limited extent — became interested in industrial hygiene late in the 1930's. The interest of the life companies is concerned with industrial group health insurance coverages. The compensation carriers support industrial hygiene programs to provide service to policyholders, and to control occupational disease and catastrophe loss.

The educational institutions provide teaching talent and conduct research in various phases of industrial hygiene. More recently, at least one large university system has established an industrial hygiene program to serve much the same purpose as an industrial program.

Several Specialty Groups

The specialty groups comprising the industrial hygiene profession are air pollution, industrial hygiene chemistry, engineering, radiation and toxicology. It might appear that these groups have widely differing objectives and interests, but actually they are bound together by a common basic interest in industrial health maintenance and each group is dependent upon the other for either essential information, direct assistance or both.

The annual meetings of the American Industrial Hygiene Association are designed to satisfy both the general interests of the membership and those of each specialty group. The first portions of the program are devoted to general interest subjects, and then one day or more is devoted to concurrent sessions covering the specialty groups. The engineering specialty group is concerned with industrial ventilation and other problems related to industrial hazard control. There have been important accomplishments in this field and a few are discussed briefly.

Industrial Ventilation Important

Many contributions of industrial hygiene to the field of engineering have appeared in other than industrial hygiene publications, and some of these have been the source of controversy. There are still plant and ventilation engineers and others who do not accept industrial hygiene standards of air cleanliness for purposes of industrial ventilating system design.

The success accomplished in industrial process ventilation may almost entirely be attributed to the efforts of the industrial hygienist. This was brought about through recognition of the fact that certain chemicals or materials used in industry are more toxic than others. This approach to industrial ventilation design involves the use of accepted maximum allowable concentration values in specifying plant air cleanliness, and the design of ventilating systems is based on the principle that the particular contaminant involved be reduced to safe levels at the breathing zone of the worker. The extent of exposure, of course, can be determined only through workroom air sampling and analysis. The industrial hygienist found through experience that the proof of a good ventilating system is not necessarily the good air flow contour of a hood, but rather the effect the resulting plant atmosphere has on

DR. PHILIP DRINKER has been a member of HPAC's board of consulting and contributing editors since the first issue in May 1929. He is noted for his service in the field of industrial hygiene, dust control and related subjects for 30 years. He is a professor of industrial hygiene in the school of public health at Harvard University and is editor of the AMA *Archives of Industrial Hygiene and Occupational Medicine*. Dr. Drinker suggested that HPAC invite Mr. Walworth to prepare this article for publication in this issue

the exposed worker. By basing ventilation design on this principle, it has been possible to economically control many of industry's health hazards.

There are still those who belittle this procedure. They disregard industrial hygiene principles and practices and adopt the principle of doubling or tripling air exhaust if the first trial is not successful. Such a practice is neither economical nor sound. Certainly, the design requirements should not be the same for a beryllium dust hazard as for a lead dust hazard where the equipment involved may be entirely different. Would one expect the same specifications for air flow in both cases where one material is several times more toxic than the other?

The additional procedure of checking plant atmospheres by air sampling and analysis before and after the installation of the system provides valuable reference data on the extent of worker exposures, and serves as a check on the efficiency of system operation. The use of such procedures "proves the pudding" by at least sampling it.

Much of the basic work on exhaust system transport velocities and their application to design was contributed by the industrial hygienist. Also, the work of the National Conference of Industrial Hygienists in its publication, *Industrial Ventilation Manual** is a major contribution in the industrial ventilation field.

Radiant Heat Control

More recently, the industrial hygienist has taken the lead in specifying principles of control for radiant heat exposures in industry. Problems of comfort and worker efficiency have always been the concern of the hot industries. Until recently, the accepted method of improving comfort in such industries was to provide air movement in quantities far exceeding usual accepted standards. Even so, the relief afforded workers often was only slight.

Studies in the glass industry established that the principal exposure was radiant heat, which was little affected by air movement. When this was recognized, studies revealed that the proper installation of radiant heat shields and reflectors and the application of sound general ventilation improved comfort to acceptable standards.

While the fundamentals of general ventilation are not complicated, this is the most mis-used method of air movement from the standpoint of design.

Errors in general ventilation design are frequently demonstrated in buildings which are completely "air bound" because of failure to provide air intakes for make-up air. In other cases, exhaust fans may be installed in opposite walls with little or no consideration of the location of air intakes. Such layouts frequently result in churning of the air within the workroom or plant, with the result that the entire work area is contaminated with smoke, fume or whatever is the contaminant present. Perhaps much of the fault in these cases lies with industry itself for not considering the overall design when purchasing general ventilation. However, the heating, ventilating and air conditioning engineer or contractor can be of great service to industry by recognizing these deficiencies and suggesting the proper correction wherever possible.

What About the Future

Possibly one of the most urgent needs in this field is a common understanding between the heating, ventilating and air conditioning engineer and the industrial hygienist. It is suggested that the heating, ventilating and air conditioning engineer and contractor become familiar with industrial hygiene terms, procedures and standards as they apply to the control of the industrial working environment. This should include an understanding of industrial health hazards, of maximum allowable concentration values for harmful materials used in industry and how they are used, and the application of industrial hygiene standards to control. It is also important to recognize that in providing ventilation for protecting the worker inside the plant, an air pollution problem may result outside.

These factors are also applicable to architects, plant layout engineers, and machine and tool designers. Unless industrial hygiene principles can be applied in the planning stages of industrial plants or operations, many costly changes may be necessary after the plant or operation has been completed. This is especially applicable at this particular time in connection with the industrial noise problem. Perhaps more can be accomplished in industrial noise control in plant layout and in machine design with less cost, than would be expected by instituting changes after plant construction has been completed. Heating, ventilating and air conditioning engineers and contractors are confronted with noise problems in connection with fans, pumps, and ventilating and heating system installations. Thus, an understanding of the fundamentals of noise and the various standards applicable to control is valuable — perhaps essential.

The future of industrial hygiene rests with an energetic American Industrial Hygiene Association capable of meeting the needs of an expanding and changing industrial economy. The association now is in the process of expanding the scope and function of its technical committees, and appointing new committees which will study the needs of its specialty groups. It is hoped that these committees will also set the patterns for acceptable procedures in the specialty fields which will eventually be useful to industry and others associated with industrial health.

The association is now taking an active part in the functions of the American Standards Association. It is also in the process of developing hygienic guides which will be useful to industry and others in the field of health hazard control. It will continue to cooperate with other associations and groups toward the end of fulfilling its obligations to the worker and to industry.

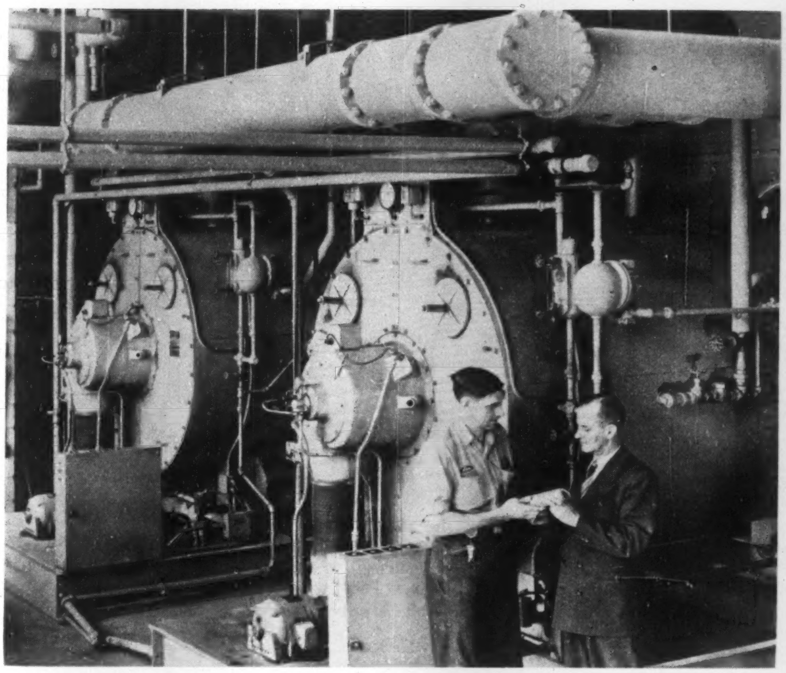
**Industrial Ventilation — A Manual of Recommended Practice*, American Conference of Governmental Industrial Hygienists, January, 1951.

Big Housing Boom Predicted for 1960's

. . . due to population increase

A HOUSING production boom in the 1960's far beyond the present volume was predicted last month by John R. Dempster, president of the American Savings and Loan Institute, at the institute's 29th annual conference.

The building rise will be caused by the expected huge increase in the nation's population, he said.



WHENEVER THE sq ft of heating surface allowed per boiler hp is of particular significance, the calculation procedure should also be specified

Measuring Boiler Heating Surface

. . . it's important to know which method is used

By Robert C. Gray
Engineer, Orr & Sembower, Inc.

HEATING SURFACES are the areas of a boiler which are in contact with the boiler water and that are exposed to either incandescent fuel, hot refractory materials, hot flue gases or all of them.

The effectiveness of the heating surface — or the rate of heat transfer — is dependent upon a number of items, such as the temperature differential between the water on one side and that of the gases on the other side, and the rate of circulation of both the water and the hot gases.

Likewise, heating surfaces may be classified as direct and indirect. Direct surfaces are those exposed to the incandescent fuel or refractory and are particularly effective in the transfer of heat to boiler water both by radiation and convection. Indirect surfaces are those in contact with flue gases only and are progressively less effective from the standpoint of heat transfer as the flue gases become cooled.

For many years, designers have rated boiler output on the basis of 10 sq ft of heating surface per boiler hp. Today, this base of 10 sq ft of heating surface per boiler hp is not believed to be in as common use as it once was, because of engineering advancements, the many different types of heating surfaces employed in modern boiler designs, the maximum utilization of radiant heat and the improved circulation rates of both boiler water and flue gases.

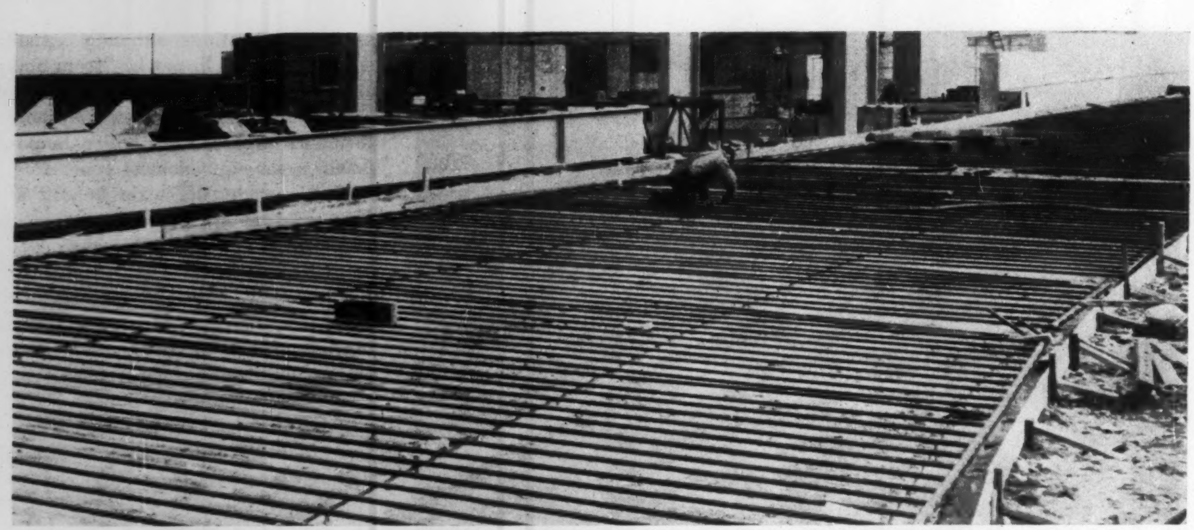
In the firetube boiler industry, horsepower ratings are widely used as nominal ratings although actual steam output in lb per hr "from and at 212 F" is gaining increased acceptance as reflecting more accurate performance figures. A boiler horsepower is the equivalent of generating 34.5 lb per hr of steam at 212 F from water at 212 F.

Many plant engineers and consulting engineers are still interested in the actual sq ft of heating surface per boiler hp allowed by the boiler designer, particularly in the processing and heating fields served by the packaged automatic boilers. Here, a figure of 5 sq ft of heating surface per boiler hp is frequently specified in bid invitations.

How To Measure Surface?

There is an opportunity for confusion in the simple naming of any specific sq ft figure, since there are two generally accepted ways of measuring boiler heating surface. The American Society of Mechanical Engineers states — in the instructions for determining steam safety valve capacities — that "the heating surface exposed to the products of combustion . . ." which, on a firetube boiler is the internal or smaller diameter surface. This system of measurement is used by several manufacturers of packaged automatic boilers. The conventional firebox boiler industry conforms to and publishes heating surface figures according to the Steel Boiler Institute system of measurement on the side of largest diameter — which, in a firetube boiler, is the external water side.

The difference in the two systems is considerable and may be in excess of 10 percent unless the requirement for a specific heating surface is further qualified as to the basis for measuring the heating surface. Thus, if 5 sq ft of heating surface is specified — meant to be on the ASME basis — a conventional steel firebox boiler assumed to have met all the other specifications may be furnishing only 4.4 sq ft of heating surface by ASME standards. On a design of 10,000 lb per hr of steam this would result in a shortage of 174 sq ft of heating surface. While the above example may not be an average one, it does illustrate the great variance that can be encountered in actual practice.



SNOW MELTING piping is installed in the lower ends of the ramps, which are on earth fill between retaining walls, to provide sure acceleration areas going up and safe braking areas going down

Big Snow Melting System

. . . serves earth fill ramps at Boston's new elevated highway. Their slope and curvature complicate piping design, installation

By Edson E. deCastro, Engineer
Fay, Spofford & Thorndike, Consulting Engineers

A NUMBER OF articles have been written about the Boston Central Artery, and some of them have given brief descriptions of the snow melting system now being installed in the ramps of that elevated highway. However, there has been no complete description of this snow melting system. Since this subject is of considerable interest to engineers and contractors, this article presents as complete design information as possible on the snow melting system.

In Earth Filled Ramps

The superstructure of the elevated portion of the artery is a steel framed viaduct with reinforced concrete deck — except for the lower ends of the ramps, which are on earth fill between retaining walls. It is these earth filled lower ends of the ramps in the downtown area, where central steam service is available, that are to be heated for snow removal in order to provide sure acceleration areas on "up" ramps and safe braking areas on "down" ramps.

Snow melting is being installed only in the earth filled portions of the ramps because:

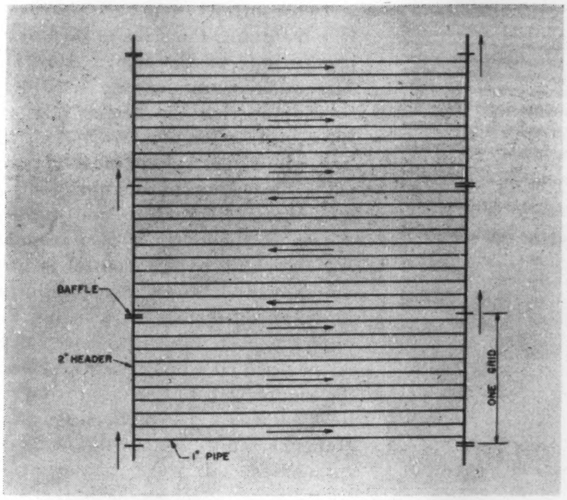
1) Considerably more heat per square foot of surface is needed for the portion of the ramp on structure than for the part on fill, because of the greater heat loss of the exposed underside of the roadway — even though insulated.

2) The installation cost of the snow melting piping on structure was estimated to be considerably more than for the part on fill.

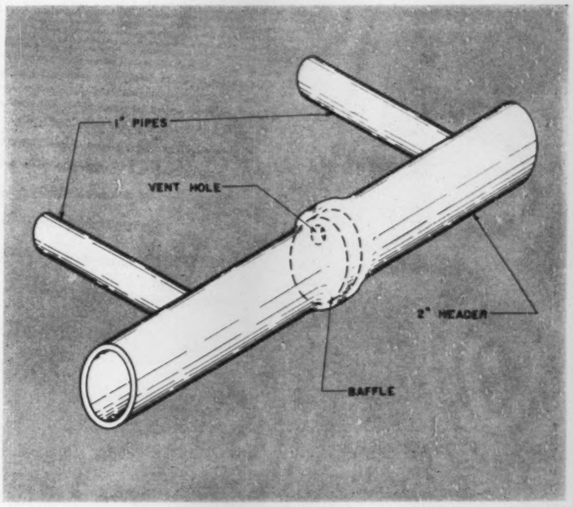
3) The portion of the ramps on fill is roughly equal to the part on structure and therefore more than twice as much steam would be needed for the complete ramp than for just the part on fill.

The system is conventional in that a warm antifreeze solution is circulated through pipe grids in the ramp pavement. It was designed to melt approximately 1 in. per hr of snow. However, the solution heaters have twice this capacity in order to reduce the time for warming up the roadway slabs and to provide sufficient overload capacity.

A greater rate of snow melting was



BAFFLES ARE PLACED in the headers at regular intervals to direct the flow across the ramps and form a series of grids. Since the grids are at right angles to the roadway, the grid headers butt each other. Arrows indicate fluid flow



ENTRAPPED AIR is vented up each ramp to a point of elimination through a ⅜ in. diameter vent hole drilled through the top of each baffle. Only about 4 percent of the antifreeze solution bypasses the grids, but air passes readily through the holes

considered, but the larger quantity of steam required was not available. The ability of the utility company to supply steam had to be considered, particularly because the use factor of snow melting systems is quite low and the demand rate quite high. Large snow melting loads only become practical when the utility company has a large connected heating load. Most snowfalls occur in the 20 to 30 deg temperature range, whereas the greatest space heating load is at zero or lower. A surplus of steam for snow melting is therefore usually available at the time when most needed.

Piping Design

Pipe design for snow melting on the ramps presented several problems. The two most pressing were the necessity for balancing the solution flow through the piping, and the problem of air removal. A ramp must — by definition — slope up or down, depending on the direction of travel, and it may be curved entirely or only in part. This curvature results in the highway being banked (that is, higher on one side than on the other) and complicates the problem of air removal. The above-mentioned design problems limit the possible configuration of the snow melting piping considerably.

Sinuous coils cannot be easily used because of the problem of venting the air from each separate hairpin loop when one side of the roadway is higher than the other. A further limiting consideration is added when access boxes for balancing valves cannot be placed in the roadway due to high roadway loading, continuous traffic and a covering of blacktop over the concrete. It was desired that the blacktop be used on the ramps to conform with other portions of this project.

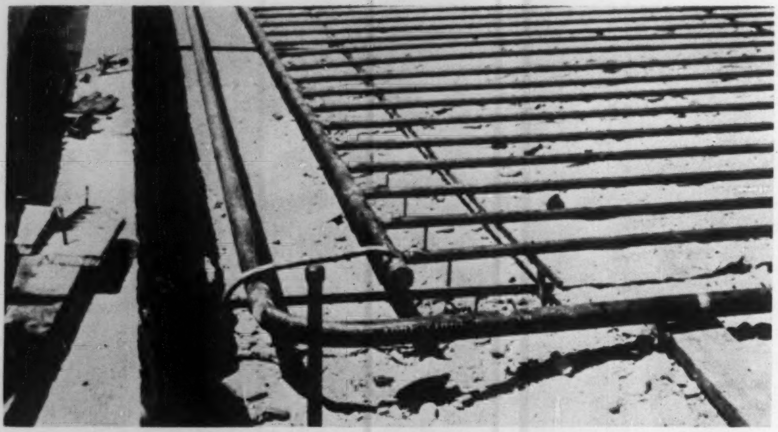
Due to the limitation on access boxes, the piping systems in the ramps must be self-balancing. Pipe grids with opposite inlets and outlets meet this requirement, and, therefore, the piping in the ramps consists of a series of grids. Since the grids are at right angles to the roadway, the grid headers butt each other, forming continuous headers running the length of the slab. Baffles are placed in the headers at regular intervals to direct the flow across the ramps and form a series of grids.

Entrapped air is vented up each ramp to a point of elimination through a ⅜ in. diameter vent hole drilled through the top of each baffle. Air passes readily through the holes, and only about 4 percent of the solution bypasses the grids since the pressure head between any two adjacent grids is small. Another advantage of the series of grids arrangement of the piping is that it facilitates construction. The grids — consisting of ten 1 in. pipes on 12 in. centers, welded into 2 in. headers — can be shop fabricated and joined together in the field. Field welding is thus greatly reduced and construction made easier.

Supporting the Pipe Grids

The wrought iron pipe grids rest on four parallel rows of supporting bars. These supporting bars are fastened to steel uprights set in 8 in. wide concrete pads running the entire length of the slab. The supporting uprights are set to proper level by instrument before the pads are poured. The 1 in. pipes of the grids are then securely wired to the supporting bars to prevent the grids from moving when pouring the roadway concrete.

The normal maximum length of concrete roadway slab in Massachusetts is about 105 ft. The ramp slabs in the snow melting system vary from 60 to 110 ft, depending on design of the ramp. Each slab, therefore consists of from six to 11 grids in series, each ramp comprising one or two slabs as required. Loops are placed between the slabs to provide for expansion. Catch basins are located as close as possible to the lower



THE RAMP SLABS vary from 60 to 110 ft, depending on ramp design. Each slab consists of from six to 11 pipe grids in series, each ramp comprising one or two slabs as required. Note air vent pipe in this view

end of the heated portion of each ramp in order to remove all water from melted snow and prevent puddles that might later freeze on the unheated part of the roadway.

Piping to Pump Houses

All of the piping connecting the ramps with their respective pump houses runs underground, with the single exception of the return lines to the pump house near the North Station. These returns are overhead, concealed in the highway structural steel as much as possible. All of the solution piping slopes back to the pump houses for drainage. Pipes are run parallel, are grouped together, and are encased in vermiculite water resistant insulating concrete, which in turn is wrapped in a waterproof envelope.

There are five pump houses serving the section of the highway now under construction in Boston. Each pump house takes care of from two to four ramps, there being a total of 14 heated ramps. The return pipe from each slab has a separate regulating cock and thermometer in the pump house, making it possible to properly proportion the quantity of solution being pumped to each slab regardless of its size or distance from the pump house.

Steam is supplied to the snow melting system at three locations by the Boston Edison Co. Service manholes are located near North Station, Fort Hill Square, and on Minot St. just off Nashua St. The North Station manhole furnishes steam to two pump houses, as does the manhole at Fort Hill Square. A steam tie line runs between the two pump houses that receive steam from one service manhole.

Each pump house contains pumps, heat exchangers, an expansion tank and control equipment. The pumps are sized to circulate the required quantity of ethylene-glycol antifreeze solution through the grids. The solution heater is designed for twice the normal capacity calculated to raise the temperature of the antifreeze solution 30 F. The economizer is sized to extract the maximum possible heat from the condensate before discharging it to the sewer.

Controlling the Snow Melting

Snow melting equipment in the pump houses can be automatically controlled after starting, but requires manual starting. Consideration was given to various schemes for starting snow melting equipment at the beginning of a snowfall, but it was decided that starting the system at the beginning of a snowfall was too late and, therefore, any such system would be inadequate. It takes 4 to 8 hr or more to warm up the slabs to snow melting temperature. Therefore, either the system must be maintained during the winter months at the snow melting temperature (35 F) or it must be started several hours before a predicted snowfall.

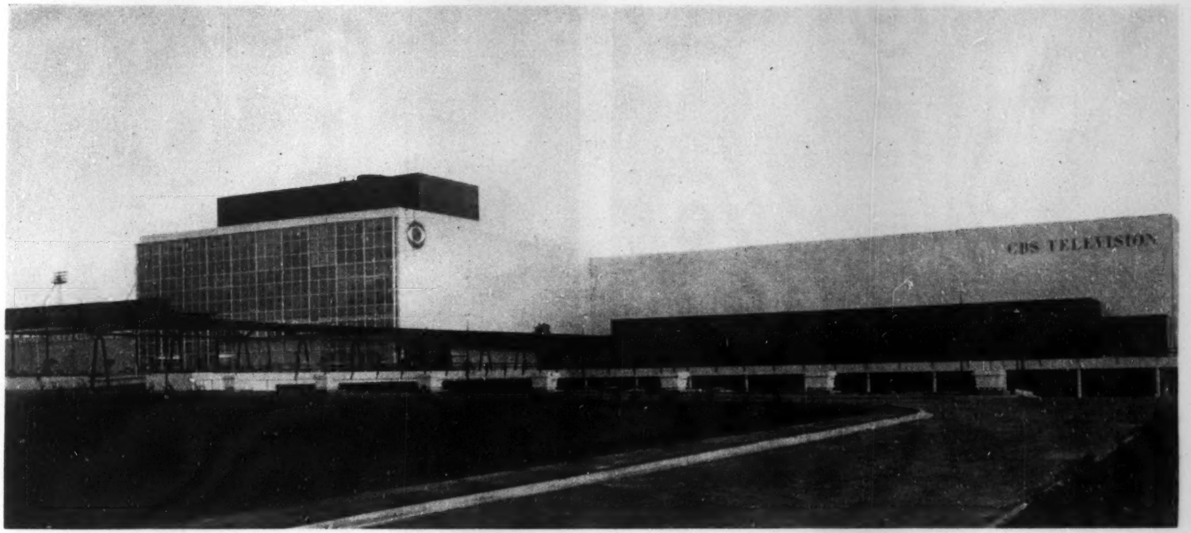
Two control systems are provided. One maintains the slabs at 35 F during periods of threatened snowfall. The other maintains the antifreeze solution leaving the heater at a set snow melting temperature as long as desired. Either system must be manually started by pushbutton control and the change from one control system to the other is also manual. An automatic bypass control is provided in order to prevent the returning solution from ever reaching the pumps at a temperature lower than 35 deg, which would possibly freeze the economizer. The solution from the heater tempers the solution returning from the ramps so that the temperature of the mixed solution entering the pumps will never be lower than 35 deg.

Initially, the temperature of the solution leaving the pump houses will be limited to 160 F to eliminate any possibility of softening the blacktop where it rests on the concrete. Although there is no danger of reaching temperatures high enough to soften the blacktop while actual snow melting is in progress, there is a possibility that the temperature of the blacktop may become too high when drying off the roadway to prevent later freezing of the wet surface. Such freezing would be as great a skidding hazard as the original snowfall, and, therefore, the ramps must be free from water before heating is discontinued.

Largest Such System

The actual operation of this system will have to await completion of construction of the highway, as well as the snow melting systems in the ramps. Performance data will be awaited with great interest, since this is the largest snow melting system yet undertaken, even though snow melting systems in individual ramps of larger size have been installed — such as in the ramps of the New York Port Authority's bus terminal in New York City.

The design was made by the firms of Charles A. Maguire & Associates and Fay, Spofford & Thorndike for the Massachusetts Department of Public Works, John A. Volpe, Commissioner. The snow melting system is being installed by the Merrill Co., Boston, for the general contractor, V. Barletta Co., also of Boston.



AIR CONDITIONING the new CBS Television City required that provisions for expansion be included in the design. Here, the studio building is shown on the right and the service building on the left. Note full glass exterior walls for expansion

Tremendous Heat Loads

. . . are involved when air conditioning a project such as the new CBS Television City

By F. A. Sayler and J. M. Ayres
Chief Engineer and Chief Mechanical Engineer
Pereira & Luckman, Architects & Engineers

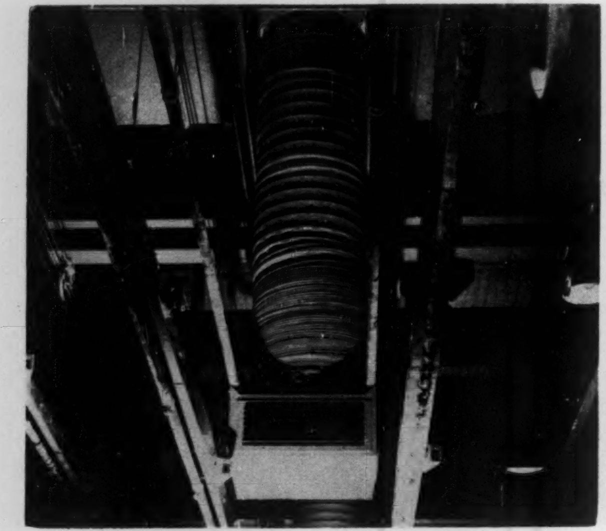
• Like everything else at CBS Television City, the air conditioning facilities are big and complete. Two 335 ton centrifugal compressors supply the chilled water which is the cooling medium. The studio building requires the bulk of the cooling capacity because of the tremendous lighting load in the four studios. Each studio requires 100 tons of air conditioning capacity — 75 tons to take care of the lighting and the balance for outside air and people.

An interesting innovation in air distribution in the studios is the use of movable supply air outlets. Collapsible round rubber ducts, which may be lowered from 15 ft to 27½ ft above the floor, provide the studios with a means for spot cooling. The other facilities are all air conditioned too, and the details of the installation — including the provisions for air conditioning the control booths and the central technical area — are described here.

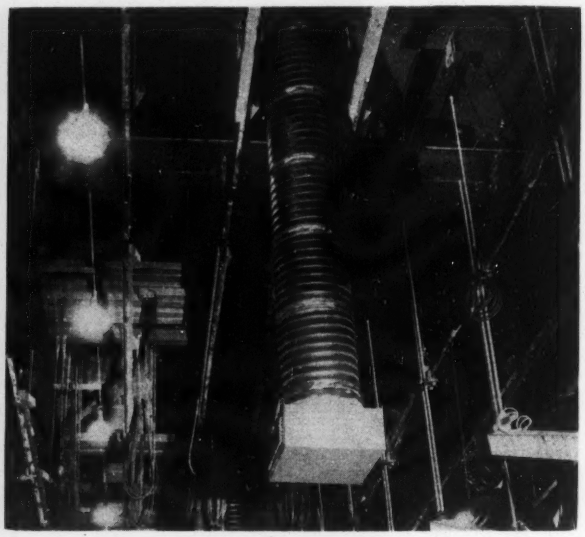
THE NEW CBS television production facility in Los Angeles is the initial unit of a full television city, which when completed will be the largest urban development since Radio City was built around radio in New York. The ultimate project will cover 25 acres and will include not only 24 large production studios and supplementary set production facilities, rehearsal halls, etc., but also adjoining office buildings, stores, restaurants — all the necessary facilities to support a small city.

670 Tons of A.C. Installed

The initial structure is at the core of the final development, with future



MOVABLE AIR SUPPLY outlets are provided in each of the studios. Collapsible 22 in. round rubber ducts reinforced with a spiral wire are attached to the overhead supply ducts. Here, the supply outlet is in the fully raised position



THE MOVABLE supply outlets shown here are in the fully lowered position. Rigging eyes are available on each outlet for horizontal positioning to concentrate cool air on spots heated by heavy lighting

expansion provided not only to each side and to the front, but upward as well. The project consists of two adjacent buildings, the studio building, containing four tremendous studios, three large rehearsal halls, dressing rooms, central technical area, transformer rooms and set storage, and the service building, housing many production line facilities for set construction, including design, carpenters, paint, electrical, fabric shops, etc., as well as the office and administration areas and lobby. The structure covers 8½ acres and cost CBS about $12 million, which includes 670 tons of air conditioning capacity.

Air conditioning for any television facility is essentially a problem of removing the tremendous sensible heat loads originating from the production lights and other auxiliary equipment. In this project, a central chilled water and hot water system is installed, using two 335 ton centrifugal compressors and two 250 hp low pressure steam boilers. This arrangement provides the flexibility needed to cool one area while heating another. The system is designed to meet the expandability requirements and yet the major elements, such as the refrigeration machinery room and the boiler room, are permanently located. Sixteen fan rooms throughout the project provide not only for air conditioning, but heating and ventilating as well. Since the air conditioning loads in the offices, lobby, dressing and make-up rooms, are not unconventional, this discussion will be limited to the studios, the control booths and the central technical areas — the areas where unusual air conditioning treatment is necessary.

Studio Heat Removal

The studio building consists primarily of four huge studios each 110 ft x 110 ft x 40 ft high. Two are designed for audience use, and two are not. In the audience studios, the audience sections are dished out below the performing floor level to keep the spectators away from the cameras and also to enable these areas to be filled in if future television developments make audience participation obsolete. On the main floor between the audience and non-audience studios is a large service corridor with three large rehearsal halls on the floor above. Each studio is equipped with an overhead grid system of pipes, spaced 3 ft on centers, 90 ft long — in 30 ft sections — which is suspended from the roof trusses. This grid system supports the hundreds of lights, set drops, etc., and can be raised and lowered for rigging.

The uncertain role of future color television prompted conservatism in estimating the lighting loads which constitute by far the largest single cooling problem. Each studio is wired for 750 kw, or a maximum possible 62 watts per sq ft, which in itself represents 2,560,000 Btu per hr or 214 tons of air conditioning capacity. By comparison, the balance of the sensible heat loads from the people, transmission through the sound treated walls and roof amounts to about 180,000 Btu per hr during peak afternoon loads — a small amount compared to the maximum possible lighting loads. It was quite evident from the outset that careful analysis of the lighting load was needed.

Study of the use of the studio lights revealed that, during production, it is very seldom that more than half of the large studios are lighted — that when production lights are on, the house lights are off — and that if possible only sets under the camera are fully lighted. Conferences with the lighting director indicated that the average show is now taking only about 130 kw, a surprising 17.5 percent of the wired capacity.

Light Loads Largely Radiant

The heat transfer from the high intensity overhead lights takes many paths before it is picked up by the room air. The light fixtures dissipate short wave visible radiant energy downward, but at the same time they give off long wave infra-red radiant energy that is transferred upward as well as downward. This virtual shower of radiant energy strikes the actors, sets, etc., where it is absorbed and goes into storage. After a time lag, these surface temperatures are raised, and the heat is then transferred by radiation and convection to the room air. The time lag increases with the thermal mass of the absorbing material and may be as high as 3 hr, but modern television shows are often rehearsed 6 to 8 hr, and the use of this thermal storage in reducing the air conditioning loads by precooling is thus impractical.

The radiant heat transferred downward from the light fixtures cannot be controlled without interfering with the light transfer, but the heat dissipated from the back side of the lights can be removed before it is picked up by the cool supply air. This is achieved by introducing the air at the level of the lights and exhausting the warm air from the back side of the lights. In small studios, this procedure is easily accomplished by using side wall air distribution below the lights, but in larger studios this is impossible because of the limited blow obtainable with the low grille velocities dictated by the studio sound level. In addition, the supply systems must meet the need of modern large scale television production methods — which involve high angle camera shots, rapid scene changes, angular stage settings, and complete flexibility in the use of the overhead battens.

Supply Air Outlets Movable

To meet all of these requirements in this project, overhead air distribution was necessary, and the outlets had to be movable. This is accomplished by mounting the supply outlets on collapsible 22 in. round rubber ducts — reinforced with a spiral wire — that are attached to the overhead sheet metal supply ducts. The supply ducts are mounted 36 in. above the bottom chord of the roof trusses, and at each movable outlet the duct supports are strengthened with an angle iron frame to take the additional weight of the collapsible duct and outlet. The collapsible rubber duct is firmly attached at one end to a sheet metal collar on the supply duct, and at the other end it supports a 26 in. × 26 in. × 11 in. sheet metal box with four vertical supply grilles.

The supply boxes consist of an angle iron frame with a 22 in. × 8 in. double deflecting supply register on each side, and a sheet metal bottom and top. The rubber duct is fastened to the neck of the outlet and the supply duct with bolts, and a 1 in. steel drawband. The 250 lb weight of the duct and the outlet is actually supported on a 3/16 in. cable in the center of the rubber duct, which is attached to 1½ in. pipes fastened to the angle iron frames of the outlet box and the overhead supply duct. The ducts are 15 ft 6 in. long and are capable of moving from 15 ft above the floor to 30 in. below the bottom of the truss, or 27½ ft from the floor. Surprisingly enough, this installation did not cost any more than if 22 in. round sheet metal ducts supporting fixed outlets 16 ft above the floor had been used.

In keeping with the experimental workshop philosophy of the entire project, the movable supply outlets are mounted in two ways. In the audience studios they are attached to the lighting battens and move up and down only. In the non-audience studios, the outlets hang independently between the battens like elephant trunks and are available for miscellaneous special rigging. The outlet boxes on the latter are provided with rigging eyes at each corner and can be moved from 7 to 8 ft horizontally, for spot cooling. In addition to the provisions for special rigging of the outlets, each supply register has multi-louvered dampers which can be adjusted to increase the air supply in one direction if desired.

1920 Cfm per Outlet

Each movable outlet with its four registers delivers 1920 cfm, or 480 cfm per register, and are approximately 20 ft on centers. In the audience studio, movable outlets are only over the production areas. In the audience seating areas, standard fixed circular outlets are mounted near the bottom chord of the trusses. The non-audience studios are designed to receive 48,000 cfm of supply air each — about 4 cfm per sq ft — requiring 100 tons of refrigeration capacity, and the audience studios receive slightly less, since less studio area is under production lighting.

Each studio has an exhaust system mounted high in the roof truss area to remove the heat dissipated from the back of the lights and to expel the studio supply air. The exhaust systems are designed to remove 75 to 80 percent of the supply air, and the balance is exfiltrated through adjacent toilets, dressing rooms, control booths and door cracks.

The air handling units are mounted on the roof of each studio and contain the supply and exhaust fans so arranged that the exhausted air can be returned to the supply fan during peak cooling or heating loads. The room thermostat is mounted on the face of the control booth at the rear of each studio and is provided with a manual override to change the system to full heating or full cooling as desired for special set loads.

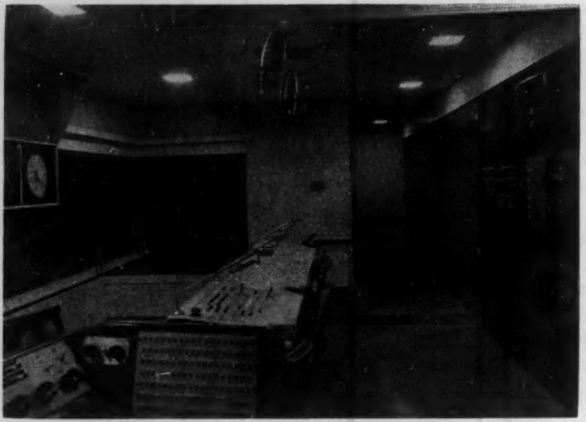
Heating Load Is Small

The heating load on each studio is so small that it is possible to use only one of the three required vertically stacked cooling coils for heating, bypassing the air through the two non-heated coils. The chilled water and hot water to the coils is controlled by means of two position changeover valves operated by end switches on the hot water and chilled water three way mixing valves.

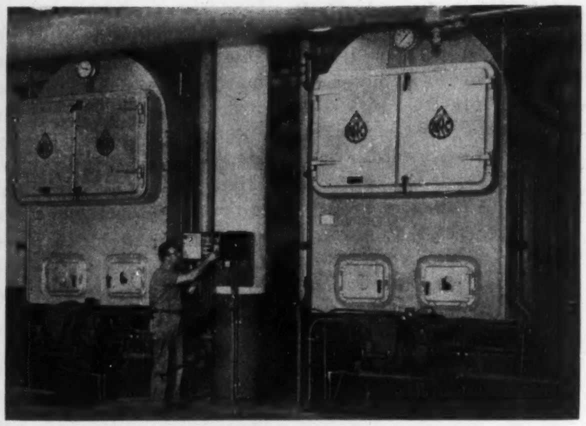
The sound treatment for the studio air conditioning consists of 2 in. spun glass sound absorbing blanket faced with ordinary chicken wire on the interior walls and ceiling of the roof air handling units, 1 in. of spun glass sound liner on the supply and exhaust duct interiors, fan and motor anti-vibration bases and flexible fan connections, and low duct and grille velocities. Some question was raised concerning the necessity of sound lining on the exterior of the sheet metal ducts in the truss area, but none was applied during construction and none is needed today.

Control Booths Must Be Cooled

At the end of each studio is a control booth which contains the audio, video and lighting directors' stations,



THE CONTROL BOOTHS are small and have heavy sensible cooling loads, principally from the adjacent power racks shown on the right. Separate 55F supply air enters the bottom and is exhausted to the outside after passing through the rack



THESE 250 HP low pressure boilers use either natural gas or No. 5 oil and they supply separate heating services for Television City. Electric preheaters raise the oil temperature prior to delivery to the burner

announcers' booth and space for the producer and a few clients. The rooms are small — 23 ft x 14 ft — with 8 ft ceilings — and they have heavy sensible cooling loads, principally from the adjacent power racks, and special sound levels must be maintained.

To keep the room sensible heat load and the subsequent air changes down to reasonable limits, it is necessary to remove the power rack heat separately. The sensible heat load of the power racks, which average from 1 to 2 kw each, is removed by supplying cooled air at the bottom of the rack and exhausting it out through the top. The rack load averages about 20 kw in each booth, and 70 cfm per kw is supplied at 55 F. This design allows a 45 F rise in the air to maintain a 77.5 F average rack temperature. Under these conditions, the rack surface temperatures are only slightly above room air temperatures — due to radiant heat transfer from the tubes — and almost all of the rack heat is successfully removed from the room.

Separate Fan and Coil Used

A separate fan and coil unit is installed for each control booth to handle this power rack load as well as the 23,100 Btu per hr sensible heat from the people, lights, television monitors and other miscellaneous equipment. Electric strip heaters are used for zoned reheat in the announcer, audio and video rooms. Supply air for the control booths is taken from the studios, except in the audience studios where it is taken from the outside. All control booth exhaust is discharged to the outside through the studio roof.

Special care was taken in sound treating the control booth to keep the sound level of the control area below 40 db, the announcers' booth 30 db, and 45 db noise transmission between rooms. The duct velocities are held to 500 fpm maximum, the diffusers are selected for a maximum of 27 db, and the necks of the diffusers are attached to the supply ducts through flexible connections. The ducts are acoustic lined inside, they are isolated from the structure, and sound traps are installed to reduce the sound attenuation.

Technical Area Provided

A central technical area was provided by CBS for this project. It includes all of the various technical operations other than shooting the show in the studios. It consists of a master control area, telecine area, TVR area, program coordination area, miscellaneous film cutting, editing rooms and storage areas, and offices.

Most of the electrical equipment for these spaces is composed of 2 ft x 2 ft x 8 ft racks which dissipate from 350 to 2,000 watts each. These racks are lined up in rows, some with enclosures and others with the front and back open. The preferred method of installing separate supply and exhaust systems for the rack loads could not be used in most areas because many pieces of equipment and racks had to be open for continuous servicing. In addition, CBS stated that the average ambient air temperature around the power racks should not exceed 85 F, although a 97 F maximum was allowed within 1 ft of the rack exterior.

The master control area is the center through which all of the programs are channeled on their way out through the coaxial telephone cables for transcontinental transmission or to the roof transmitter for local transmission. In this area there are rows of power racks, telephone transmission equipment, synchronous generators, audio and video equipment and the master control console with its numerous television monitors. The equipment load alone for this area — 3120 sq ft — is 56.6 kw initially, with 111 kw ultimately, and design conditions are 75 F in the working areas, 85 F around the racks, with up to 90 F allowed in the maintenance or infrequently used areas. A 40 db maximum noise level is maintained throughout.

The telecine rooms are the areas where films of earlier televised shows or motion pictures are fed into television cameras for transmission. The equipment comprises cameras and receivers, power racks, monitors, etc., which vary from 150 to 200 kw output. Certain pieces of equipment operate continuously, and others only periodically, so an operation diversity was developed for the periodic loads in arriving at the total sensible heat for the area. The initial equipment load for this area — 2516 sq ft — is 36.6 kw initially and 83.4 kw ultimately. Most of the area is occupied continuously by a few operators, and design conditions are 72-78 F, with 40 db maximum noise level.

The TVR room is the area where the television shows are fed into motion picture cameras for future use. This area — 2110 sq ft — was not designed at the time of construction, but CBS indicated that the expected equipment loads would probably not exceed 16.5 kw and that humidity control was required to protect the film. Design conditions are 75 F DB, 65 percent RH, with a 40 db maximum sound level.

The program coordination control rooms are the areas where the programs emanating from other than the studios — such as films or local broadcasts from trucks, ball games, etc. — are edited and organized with announcer breaks. In this area — 640 sq ft — there is concentrated an announcers' booth, a control room and an equipment room. The equipment load only in this area is 12 kw, and design conditions are 75 F in the occupied spaces and 85 F in the equipment room. Sound levels are maintained as required for the studio control booths.

The balance of the central technical area is made up of film cutting and editing rooms, TVR reference and film storage, offices, etc. These areas are equipped with conventional zoned air conditioning, with electric strip heater reheat in the film storage rooms to prevent possible moisture condensation on the films.

Future Loads Unknown

The equipment loads in these various areas are presented to give the reader an idea of the design problems. To these loads, of course, are added conventional estimates for people, lights, transmission, etc. Rapid advances in the development of technical equipment for television production are unpredictable, and it is possible that the proposed ultimate loads in this area may never be reached or may be exceeded. Consequently, the systems are designed with a sharp eye on the budget as well as the actual requirements.

A built-up fan and coil unit with several zones is installed for the central technical area to handle an initial 150 kw equipment load plus lights, people, transmission, etc., as required to handle the initial four studios, but the ducts are sized to carry the ultimate air quantities in all areas except the master control area. In this particular area, a compromise was made, and duct capacity is provided for only 75 kw of the ultimate 110 kw, due to the uncertainty of the future loads. In the undeveloped TVR area, outdoor air is provided from the central technical area unit, but a future packaged air conditioner will be added at a later date. If and when the entire central technical area reaches the ultimate load, additional fan and coil capacity will have to be added.

Wherever possible, concentrated heat loads in power racks are treated by supplying air in the base and exhausting it out the top, as described for the control booths. In other areas, return air from the air conditioned areas is pulled through the racks or equipment rooms and then exhausted to the outside. The system is designed to operate on 20 percent outdoor air, which is the amount that is continually exhausted, and 80 percent recirculated air. Sound lining, equipment isolation and sound traps are utilized throughout to meet the required noise levels.

The air conditioning design for this entire initial unit, as illustrated in the central technical area, was a continual compromise between the needs of the ultimate expanded project and the present facility. It was necessary to make provisions for expansion, but each decision had to be tempered with the understanding that a great deal of the entire project was experimental and that only certain major elements of the system would not be subject to possible future alterations. All concerned — architect, owner and engineer — will be looking forward to the information collected on this first increment to check original estimates and to obtain additional design information for the completion of CBS Television City and other new television centers.

The installation was made by Kilpatrick & Co., air conditioning contractors.

Burma Developing Pulp and Paper Industry

. . . bamboo is raw material

TWO FIRMS, Howard T. Fisher & Associates, Inc., and Robert E. Hattis, Consulting Engineers, both of Chicago, have been awarded a contract by the government of Burma for the preliminary engineering of a pulp and paper industry development to be constructed near Akyab in northern Burma.

This mill, with a capacity of 100 tons of pulp per day, is unusual in that bamboo will be used as the raw material; all of the supporting industries which will supply the necessary chemicals for production (i.e., chemical salts, caustic soda, lime and sulphuric acid) are to be developed at the same time; the project entails planning of the site, including an entire new community for the personnel employed in the pulp and paper program; and all of this industry is to be developed in an area distant from existing transportation, power, industrialization and communications.

Mr. Hattis is the author of a number of articles that have been published in HPAC.

Two Universities Mark 50 Years of Research

. . . at Iowa State, Illinois

TWO UNIVERSITIES that pioneered in engineering research will jointly celebrate the 50th anniversary of their engineering experiment stations at the University of Illinois, Urbana, on June 15. The golden anniversary dinner that evening in honor of the Iowa State College and University of Illinois stations will form part of the 62nd annual meeting of the American Society for Engineering Education.

More than 50 American learned societies and 65 from other nations have been invited to send delegates.

DC-7
DC-7 DOUGLAS

High Speed, High Altitude Airplanes Present Air Conditioning Challenge

By E. P. Heckel

Consulting Engineer
E. P. Heckel & Associates

E. P. HECKEL has been a member of HPAC's board of consulting and contributing editors since the first issue in May 1929. He is a life member of the American Society of Heating and Ventilating Engineers and has been a leader in the field of air conditioning since 1907. He has been a consulting engineer since 1939.

THE BASIC and fundamental engineering technique of air conditioning, for comfort and for industrial processing, has been well developed during the past 25 years. It appears rational, however, that still further progress will be made in equipment adaptation to special applications as additional challenges present themselves.

New Problems, Requirements

Many engineers are now fully conversant with the air conditioning requirements and problems as presently encountered for comfort in offices, stores, industrial plants, shops, homes, ships, railroad trains and surface conveyances, and the requirements in the many problems pertaining to industrial processes. Perhaps relatively few are familiar with the problems and requirements peculiar to the present day commercial airplanes and the higher altitude, high speed aircraft which may, some day, serve as commercial carriers.

Within the last year, a considerable amount of publicity has been devoted to the accomplishments of jet pilots flying their aircraft at speeds greater than the speed of sound. Breaking through what is termed the "sound barrier" had been the dream of aircraft designers, manufacturers and pilots for a long time — a dream now definitely accomplished. The aeronautical engineers, by their skill, ingenuity and applied research, have made supersonic speeds possible.

Under standard accepted atmospheric conditions, the speed of sound varies with the altitude. For example, at sea level the speed of sound is considered to be 760 mph, while at 48,000 ft altitude, it is said to be 660 mph which represents a gradual drop in speed from that encountered at sea level. However, at altitudes above 48,000 ft the speed of sound is believed to remain uniformly constant at 660 mph.

Not very long ago it was reported

that a test pilot established a speed record by flying his jet at a speed of 1350 mph at an altitude of approximately 60,000 ft. This record was later broken by another pilot reported to have flown at a speed of 1650 mph at an altitude of 70,000 ft.

High "Skin" Temperature

As so often happens, with one objective accomplished, other problems present themselves which may be equally difficult, but which must be surmounted and solved. In this case, it is *heat* — high thermal conductivity transferred inward through the aircraft shell because of the high exterior skin surface temperature created by aircraft speeds, even though flying at high altitudes, and in an atmosphere far below zero F. The exterior craft skin surface temperature varies with altitude, air temperature and craft speed, and is due to friction, usually referred to as the ram compression temperature.

It is this problem of heat transfer that presents a challenge to air conditioning engineers. The accompanying table of values assembled from various sources and published data will, no doubt, provide some idea of the problems that must be solved in order to satisfactorily air condition modern aircraft. Of course it is reasonable to assume that the pilot's cockpit or cabin should be held within a reasonable temperature range to assure alertness and comfort. This will be magnified even more should the present test planes flying at high speeds be developed for commercial use, which appears quite probable in the not too distant future.

High Radiation Also

To protect passengers and pilots from the intense thermal radiation effect that otherwise would be encountered when flying at high speeds, the interior surfaces of the aircraft will require some degree of insulation and/or radiation shielding, against the inward conductivity of high skin surface temperatures. Also, air conditioning of the craft's interior will be required to provide reasonably comfortable conditions within the space.

Until now, flying at high altitudes with plane speeds of 500 mph and above has been restricted to test pilots, flying singly or with co-pilots, equipped with all necessary equipment for body insulation and oxygen supply.

The problems encountered in heating and/or comfort cooling of the present day slower speed commercial planes are still quite severe, as is indicated by the values in the table. However, these problems are not nearly so severe and variable as will be the case when the speeds are stepped up and higher than the present altitudes are attained. Either comfort cooling and ventilation is required in summer, or heating and ventilation in winter, when the plane is grounded. At high speeds comfort cooling and ventilation will be required in summer and winter when aloft — up to 10,000 to 14,000 ft. Pressurizing and heating are necessary when flying 300-350 mph at altitudes above 14,000 ft.

The battle is against the transmission of heat or cold, which varies with the seasons when on the ground and with altitude and speeds when aloft. It is this challenge that must be successfully solved without adding materially to the plane weight, by insulation or radiation shielding or by the weight of the air conditioning equipment for comfort cooling and ventilation.

SUMMARY OF FACTORS and values involved in air conditioning aircraft at various altitudes, speeds and atmospheric conditions

Altitude above sea level, ft	Barometric pressure, in. of mercury	Atmospheric temp., F (summer standard)	Airplane speed, mph	Exterior skin surface temp., F, created by ram compression	Demands and how satisfied
70,000	1.32	−67.0	1650	425	Comfort cooling and ventilation (Pressurized)
30,000	8.88	− 7.6	1650	470	Information unavailable
10,000	20.53	+64.4	1650	550	Comfort cooling and ventilation
60,000	2.13	−67.0	1350	260	Comfort cooling and ventilation (Pressurized)
30,000	8.88	− 7.6	1350	340	Comfort cooling and ventilation (Pressurized)
10,000	20.53	+64.4	1350	380	Comfort cooling and ventilation
30,000	8.88	− 7.6	350	13	Heating and ventilation (Pressurized)
20,000	13.75	+28.4	300	45	Heating and ventilation (Pressurized)
10,000	20.53	+64.4	300	80	Comfort cooling and ventilation
5,000	24.89	+82.4	300	95	Comfort cooling and ventilation

All values shown are based on sea level barometric pressure of 29.92 in. of mercury, a ground level temperature of 100 F and at a latitude of 40 deg north.

Bank Building Modernization Surveyed

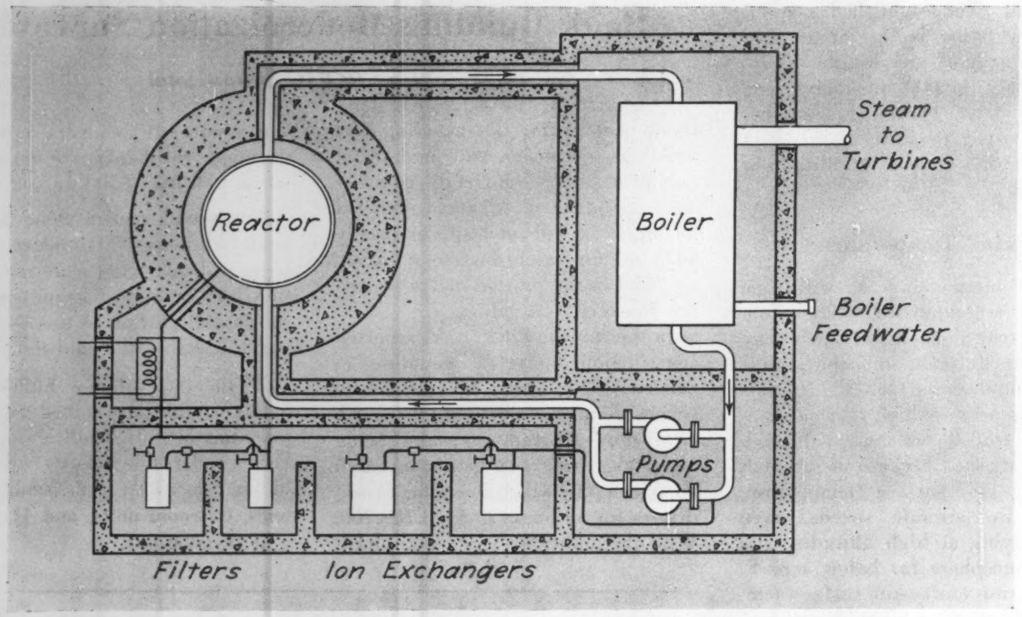
. . . close to $½ billion total

Bank construction — including new buildings, expansion and modernization programs — currently in progress or planned to be completed during 1954 will total approximately $475 million, according to a survey reported in the journal of the American Bankers Association.

In the survey, 1262 banks reported construction budgets amounting to $157,929,920, which is believed to cover about one-third of the bank expansion programs actually being undertaken this year. Estimates based on this figure will bring total expenditures for all banks to $473,789,760. With the addition of new equipment and other costs incidental to the construction, the banks are expected to spend well over $500 million.

The actual replies show 358 new bank buildings, 323 annexes or additions and 603 large scale modernization jobs in immediate prospects. A substantial portion of this new building will be in the midwest.

In the total of new building and modernization programs, banks are planning 718 air conditioning installations. Definite reports were made of which 530 are central systems, 69 room units, and 41 window unit installations.



1 PLAN VIEW of reactor system. Concrete shielding is required around the system piping and equipment to reduce the activity to tolerance levels

Piping, Pumps and Valves

for High Pressure Water Reactor Systems

By Alfred Amorosi
Associate Director
Reactor Engineering Div.
Argonne National Laboratory

• Piping, pumps and valves are very essential parts of "atomic energy" processes — as they are of most industrial and power processes. Here's an excellent discussion of the radioactivity problems of high pressure, water cooled nuclear plants and their effects on material selection and design of components. A comparison of a coal fired steam plant and a reactor system is included.

It has often been said that when people start working in a new field, they discard their old techniques and accept all problems as new. The materials of construction used in present reactors and specified in most contemplated designs would indicate that the designers have deliberately chosen either non-standard or expensive materials. However, a review of the requirements of a nuclear powered plant compared to a coal powered plant will reveal that the choice of materials and design is well-founded and stems from the requirements of maintaining the radioactivity within tolerance levels.

This paper discusses the radioactivity problems of high pressure, water cooled nuclear plants and their effects on selection of materials and design of components. Let us review the sources of radioactivity and the broad influence of radioactivity on system designs. The sources of radioactivity are the activity induced in the water itself, the activity induced

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This paper was given at this year's American Power Conference, in Chicago, which is sponsored annually by the Illinois Institute of Technology together with several cooperating universities and local and national engineering societies. One of the tables, on typical performance of wearing parts, has been omitted.

in the impurities in the water, and the activity in fission products which enter the system due to a failure in the fuel element clad.

Piping, Equipment Shielded

The activity induced in the water is caused by a neutron-proton reaction with the oxygen in the water as it passes through the reactor. Several feet of concrete shielding is required around the system piping and equipment to reduce the activity to tolerance levels, as shown in Fig. 1. Small leaks of activated pure water from the system are tolerable, since the activity is dissipated within the shielding. The activity decays rapidly (in a few minutes), since its half-life is only eight seconds. Therefore, soon after the reactor is shut down, the shielding can be removed or penetrated for access to the equipment. The increased cost of the reactor plant to handle this radioactivity is only the shielding cost.

Impurities in the water are also made radioactive on passing through the reactor. The major source of impurities is from corrosion of the system components. The total atoms of impurities compared to atoms of oxygen in H_2O are so small that the activity induced in them is much less than in the H_2O itself. Therefore, the shielding around components does not have to be increased over that required for the H_2O activity. However, the activity in the impurities does not decay rapidly, since the half-life may vary from minutes to years. Leakage of water containing only a few ppm [parts per million] concentration of impurities could produce a radioactive hazard if it were to reach areas occupied by personnel. Furthermore, deposition of radioactive impurities on system components would render the immediate area hazardous — if not untenable — for inspection and repair purposes.

To minimize impurities, pure water is used and the system, for the most part, is made of reasonably corrosion resistant materials; for example, stainless steel.

Part of Water Bypassed

Despite these efforts, the stainless steel and other materials in the system corrode sufficiently that the radioactivity could build up quite high. The system is therefore purified by continuously bypassing a small part of the system water flow through an ion exchanger and filter. While this method is successful in removing colloidal, very fine suspended particles, and impurities in solution, it does not remove heavier particles which seem to travel along the piping wall and deposit where we least want them to. It does mean that some leakage through the stuffing boxes of well packed valves is tolerable, since the purification system is fairly effective in removing the fine material which would normally escape through these leaks. Even with stainless steel systems and bypass purification, deposition of radioactive materials on components has been experienced. High temperature water reactor loops made of stainless steel with bypass ion exchanger and filter systems have had impurities continuously build up on pump and heat exchanger components so that these components were rather difficult to remove. In some cases operators were limited to only ½ hr operation at a time while removing the pumps.

If fission products were to find their way into the reactor system, the transported radioactivity from these products could be many times worse than for transported corrosion products. Very little is found in the open literature on this subject; however, the danger of fission product contamination will only add to the requirement of making the system tight. It will also add to the desire to make the system corrosion resistant, since it may be desirable to use acid to decontaminate the system.

Permissible Leakage, Corrosion

From the foregoing discussion, the importance of minimizing corrosion and leakage from the system can be realized. Let us compare the requirements of a coal powered plant with a nuclear powered plant with respect to leakage and permissible corrosion rates. In coal fired central station plants, a 1 percent leakage loss of the steam flow rate is tolerable loss. For a 300,000 kw plant, this would amount to 25,000 lb per hr leakage. For an equivalent output, something like 100 lb per hr would be the maximum permitted for a reactor plant.

Coal fired steam plant practice does not call for a leakproof condenser or for complete exclusion of oxygen from the system. To prevent oxygen corrosion, which may result from the leakage of oxygen either through seals or leakage in the condenser and in the make-up, sulphite is added to the boiler water. Phosphate is also added to the boiler water to remove the scale forming salts so that they will not deposit on the boiler heat transfer surfaces. These additives increase the impurities in the boiler drums, necessitating periodic boiler blowdown and creating as well deposition problems in the turbines. If an essentially tight system were used, additives probably would not be necessary. The use of very nearly pure water in reactor systems has therefore eliminated some of the troubles which might be encountered if additives were used.

In a coal fired plant, corrosion rates are generally tolerated as long as they do not impair the mechanical operation of equipment or cause rupture due to excessive metal losses. Corrosion rates are not high and even in more serious cases do not amount to more than 20 mils a year. The total metal corroded in a large steam plant usually does not exceed 200 lb a year. In radioactive systems, the permissible corrosion rate is expressed in pounds per year as compared to the hundreds of pounds tolerated in coal fired plants.

The major problems associated with the design of reactor systems have been briefly outlined. Their effect on the selection of materials and design of components will now be presented.

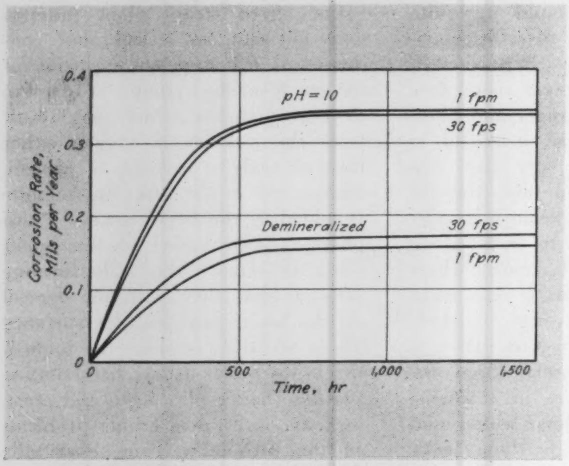
Selection of Materials

Corrosion Resistance

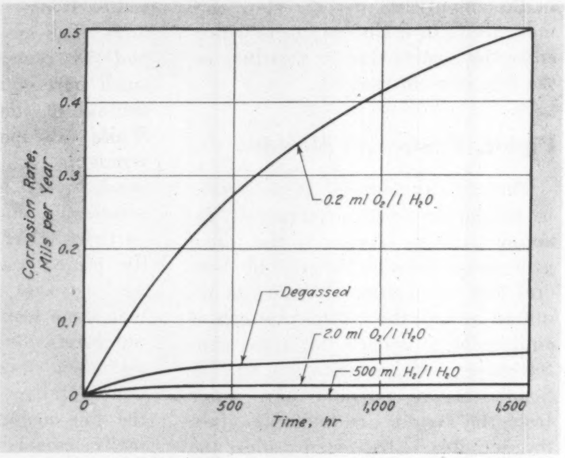
We have established that corrosion exercises a great influence on the extent of transport of radioactivity. Therefore, it is important that this criterion be given heavy weight in the selection of system materials.

Extensive tests have been made in high temperature water to determine the relative corrosion resistance of materials of interest.

Table 1 shows the relative corrosion resistance of the various classes of metals in degassed water



2 CORROSION RATE of AISI Type 347 stainless steel in demineralized water with various gas additions. Water velocity, 30 fps; temperature, 500 F. (Plotted from Babcock & Wilcox data)



3 EFFECT OF pH on corrosion of AISI Type 410 stainless steel (hardened). Temperature, 500 F; dissolved oxygen, 2 cc per liter. (Plotted from Babcock & Wilcox data)

at 200, 400 and at 600 F. Since the primary circuit of a nuclear power plant will run between 400 F and 600 F, greater weight must be given to these results. It should be noted that the standards of "good" and "doubtful" are more stringent than are commonly used in industry. It is ordinarily assumed that materials like carbon steel and ferritic stainless steel are corrosion resistant in degassed, deionized water. They are not, by the standards presently used in reactor design.

TABLE 1 — GENERAL CLASSIFICATION of corrosion resistance of metals in degassed, deionized water. G = Good, corrosion rate of less than 0.2 mils per year and no loose corrosion products. D = Doubtful, either loose corrosion products, pitting or corrosion rate of more than 0.2 mils per year. P = Poor, either heavy deposits, deep pitting or corrosion rate of more than 0.2 mils per year. [These standards are more stringent than commonly used in industry.]

Material	Temperature, F 200	400	600
Aluminum	G	D	P
Chromium plate	G	G	P
Cobalt alloys	G	G	G
Copper	G	D	P
70-30 copper nickel	G	G	P
Bronze	G	D	P
Gold	G	G	G
Nickel	G	G	P
Nickel alloys			
Monel	G	G	D
Inconel	G	G	D
Hastelloy	G	P	P
Platinum	G	G	G
Steels			
Carbon	D	P	P
Stainless			
Austenitic	G	G	G
Ferritic	G	D	P
Martensitic	G	G	P
Precipitation hardening	G	G	D
Silver	G	D	P
Titanium	G	G	G
Zirconium	G	G	G

It can be seen from Table 1 that, unless more expensive materials such as titanium and gold are used, the bulk of the reactor system materials must be limited to the 18-8 variety of stainless steels and cobalt alloys. It is not desirable to use too great quantities of cobalt alloys because of their activity. They are used for gears and wearing parts, as are some other materials, because the total quantity used is small.

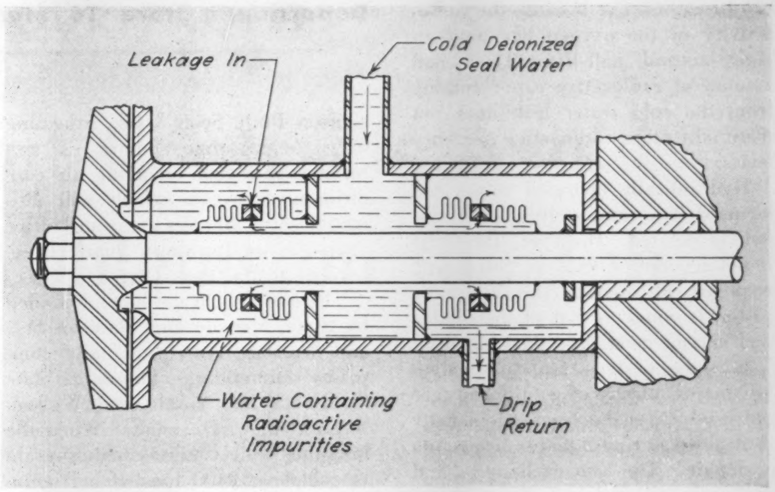
Fortunately, stainless steel shows no sign of intergranular attack in pure water. Types 304, 316 and 347 show equally good results at elevated temperatures. Heat treatment, welding and sensitization do not adversely affect its corrosion resistance.

Nitrided stainless steels and other nitrided materials were tested in an attempt to develop gear and bearing materials capable of withstanding reasonable loads. However, these nitrided materials showed erratic corrosion resistance and in general were classified as unsatisfactory. Some samples tested showed good resistance in high temperature water but poor resistance in low temperature water. Furthermore, this material in general gave very poor performance when coupled to other materials.

Effect of Water Composition

Most of the materials tested showed increased corrosion rates in oxygenated water, up to some concentration of O_2, then a decreasing corrosion rate. In some cases, the maximum corrosion rate was reached at hundreds of cc of O_2 per liter. We usually think the corrosion resistance of stainless steel is not sensitive to oxygen concentration. This is not the case. Although the corrosion rate is never very high, it varies greatly with oxygen concentration, as shown in Fig. 2. This is more pronounced in high velocity water than in static water. It happens that the maximum corrosion rate in water flowing at 30 fps takes place around 0.2 cc of O_2 per liter. The presence of hydrogen markedly improves the corrosion resistance of stainless steel. Samples tested in water containing hydrogen retained their original appearance. Samples exposed in degassed water exhibited a dark tarnish. Samples tested in water containing 2.0 cc of O_2 per liter were considerably darker and loose corrosion products were observed on samples exposed in water containing 0.2 cc of O_2 per liter of water.

Materials of interest for reactor systems were tested over a range of pH conditions. Only meager work was done on the acid side, since most materials of interest were thought to have better corrosion resistance at high pH. Austenitic stainless steel showed little difference in corrosion resistance from pH 5 to pH 10. It was hoped that the resistance of carbon steels, ferritic and martensitic stainless steels might be improved by increasing the pH to 10. However, no particular improvement was noted. To the contrary, a number of materials tested showed a decrease in corrosion resistance. Fig. 3 shows the results of tests of type 410 martensitic stainless steel. Work by Fontana of Ohio State University also indicates that increased pH does not necessarily improve corrosion resistance. These results may not be inconsistent with coal fired steam plant practice, since there is some evidence that the character of the oxide corrosion products in high pH water is different than in neutral water and that these do not deposit as readily on heat transfer surfaces.


Leakage In
Cold Deionized Seal Water
Water Containing Radioactive Impurities
Drip Return

4 PUMP SEAL for system containing radioactive impurities

Radioactivity of System Materials

Large quantities of elements which form radioactive products under neutron interaction should be excluded from the reactor system. Table 2 is a list of elements which might be considered for the reactor system. It can be seen that large quantities of metals such as cobalt, tantalum and copper should be excluded.

Water Treatment

Because it is desirable to limit radioactive impurities in the system to a minimum and since no great improvement in corrosion resistance is derived by use of additives, it is considered that the best water conditions are demineralized, degassed water or with hydrogen addition. The system is cleansed of its corrosion products by continuously bypassing a small fraction of the primary circuit through a filter and ion exchanger system. Some work has been done in an attempt to determine the limit of "solubility" of the stainless steel oxide in high temperature water. Exact values have not been obtained but they are certainly under 0.2 ppm. (For carbon steel systems, there appears to be a much higher solubility limit; thus, an ion exchanger cannot be relied upon to remove corrosion products.) It is therefore possible to attain high purity water without an equilibrium limit being set up.

Design of Components

Pumps and Valves

Pumps and valves are normally designed with the control mechanisms located outside of the water system. As a result, a seal is used to prevent leakage of water along the drive shaft. The fact that a seal may leak pounds of water per day is of little consequence in a non-radioactive system. To prevent radioactive water leakage, two general approaches can be used.

TABLE 2 — RELATIVE ACTIVITY of various isotopes caused by neutron interaction*

Material	Mass of isotope	Abundance in natural element	Activation cross section of isotope	Energy of decay product (mev)	Half-life of decay product	Relative radioactive annoyance of isotope
Aluminum	27	100	0.22	1.78	2.3m	Minor
Chromium	50	4.4	16	0.32	27d	Strong
Cobalt	59	100	22	1.33	5.2y	Very strong
Copper	63	69	4.3	1.34	12.8h	Fair
Copper	65	31	2.1	1.04	5.17m	Minor
Iron	58	0.33	0.8	1.33	45d	Fair
Nickel	64	1.0	3.0	1.5	2.56h	Fair
Niobium (columbium)	93	100	1.0	0.9	6.6m	Minor
Tantalum	181	100	21	1.2	111d	Very strong
Tin	124	6.0	0.2	1.4	9.5m	Minor
Zinc	64	48.9	0.5	1.12	250d	Strong
Zirconium	94	17.4	0.07	0.92	65d	Minor

*Abstracted from *Nucleonics*, Vol. 11, No. 6, June 1953.

The first is to completely enclose the drive mechanism in the water. In the case of pumps, an induction motor is used and a thin can is placed between the stator magnets and the rotor. The reactor system water must act as the lubricant for the motor and pump bearings. The bearings must be carefully designed since water is not a particularly good lubricant. Sometimes, high pressure water is used to "float" the journals. Since the can around the rotor must be thin, a heavier barrel is placed around the stator. This barrel normally contains air or oil to prevent the winding from shorting, as it would do if water were present. In case of rupture of the thin can, the barrel prevents a major loss of system water. These pumps are expensive and as yet are not as reliable as standard pumps.

An alternate design of pumps is to use a standard seal pump, but with a double seal. This seal is shown in Fig. 4. High pressure, completely deionized cold water is introduced between the two seals. It leaks into the system through the inner seal and out the shaft through the outer seal. Provision must be made to confine the leaks and return them to the system. The buffer seal water must have no radioactive impurities in it, but the O_2 in the H_2O

can be radioactive because the radioactivity of the oxygen has only an eight second half-life. The small amount of radioactive vapor coming from the cold water leak does not materially affect radioactive tolerance levels.

Hydraulically operated valves can be used if a completely canned system is desired. However, their use is not recommended since the piping required to operate the hydraulic piston is equal to that of the double seal arrangement described above.

In some designs, isolation valves for major pieces of equipment are not used, since the reactor is usually shut down during a major inspection or repair. The heat exchangers and pumps are located in such a manner that the reactor can be flooded for shutdown cooling while the heat exchanger or pump is drained for repair. Whenever possible where isolation valves are used on major pieces of equipment, they should be capped with welded bonnets.

Mechanisms

Mechanisms located within the reactor circuit must depend on water as a lubricant. The materials for these mechanisms must be reasonably corrosion resistant, since wear is greatly accelerated by corrosion. In almost all cases, the high cobalt materials have been found superior in wear resistance to other materials more commonly used. Chrome plated, precipitation hardened stainless steel and ductile cobalt materials are used for light load applications where ductility is important. It has been found that the best materials can only be operated at 1 to 2 percent of their design load with oil lubrication. This generalization has been found to be true for gears, ball bearings, ball bearing lead screws, and in standard wear tests.

Essentially Zero Leakage

It may not always be necessary to use expensive materials and equipment in a reactor system. However, the early development of any new and involved process can be advanced more rapidly by concentrating on the major problems, with the secondary problems likely to await experience. In the case of the radioactivity problem associated with transported radioactive corrosion products, it is difficult to predict where these products will go and how difficult it will be to cope with them. In reactor designs to date, we have chosen to use corrosion resistant materials to minimize these problems. As we gain experience with this problem, we may be able to use cheaper materials of less corrosion resistance. This can only take place after the technology for dealing with radioactive products is better developed and when personnel are trained to handle the material. Our present radioactive health practices place a premium on system impurity cleanup. Hence, the design philosophy has been to construct reactor systems with essentially zero leakage of radioactive impurities.

Design Practices Differ

These requirements have led to design practices somewhat different than used in central station steam plants. Table 3 shows some of the differences between a coal fired steam system and a high pressure, water cooled reactor system.

The last item in Table 3 shows the relative heat transfer coefficients which can be obtained in a reactor compared to that which can be obtained from the gaseous combustion products in a coal fired plant. It can be seen from this comparison that the size of the reactor heat source will be much smaller than a conventional boiler. As a result, the savings attainable from the reduced size of the heat source will tend to offset the cost of the more expensive materials.

TABLE 3 — COMPARISON of coal fired steam plant with high pressure, water cooled reactor systems

	Coal fired steam system	Present designs of water cooled reactor systems
Representative water temperature	500-650 F	500 F
System, materials of construction	Carbon steels and low alloy steels	18-8 type stainless steels
Water treatment	Sulphite and phosphates	None
Blowdown	Periodic blowdown of boiler drum	None, but continuous purification through filters and ion exchangers
Heat exchangers	Rolled, some leakage tolerated	Welded or brazed, watertight
Pumps	With seals	"Canned" or buffer seal
Valves	Packed	Hydraulically operated or with drip returns
Mechanisms	External, oil lubricated	Internal, water lubricated
Heat transfer coefficients of heat source, Btu per hr per F per sq ft	10-20	Over 1000

Department Store To Start Air Conditioning Program

. . . 2400 tons for Carson's

Carson Pirie Scott & Co., a leading Chicago department store, is embarking this year on a big air conditioning program which will ultimately serve all sales areas and office spaces in its downtown quarters, according to the York Corp.

The store — in the block bounded by State, Monroe and Madison Sts., and Wabash Ave. — actually comprises six buildings, known as State St. North and South, and Wabash Ave. A, B, C, D and E. When the long-range air conditioning program is complete, 2400 tons of refrigeration will be required.

The initial 600 ton installation to be made this year will serve the first, second, third, and fourth floors of the State St. building, and the fourth floor of the Wabash Ave. buildings. An existing steam jet refrigeration installation cools the basement and part of the first floor on State St., and will remain in use for the present.

This year's installation will include a 600 ton motor driven centrifugal refrigeration machine and a 1200 ton cooling tower. The refrigeration equipment will supply chilled water to central air conditioning apparatus — comprising heating and cooling coils, fans, filters, and other components — on each floor of each separate building.

Westerlin & Campbell Co. is the air conditioning contractor.

Clear-Cut Contracts Avoid Legal Problems on the Job

WILLIAM HURD HILLYER, author of this regular feature, is a contributor to a number of banking and financial publications and has written several books on business. His former duties as a vice president of the Atlanta Trust Co. gave him a practical legal background.

FEW CASES have been richer from legal and practical standpoints than one recently decided in an eastern state. Let's call the case Smith versus Erg Engineering Co. and Bailiwick Hotel Corp. The scene is set in the boiler room of the Bailiwick hotel, the owners of which signed a contract with Erg to install a large boiler and gas burner as part of the hotel's heating system.

Boiler and burner were delivered to Erg complete, ready to be installed. Bailiwick required that Erg purchase a particular type and make of burner—the "Pufpuf," made by Blo Mfg. Inc. [All the names herein are ficticious.] This burner was provided with a safety device so that when the pilot light went out the gas supply would be automatically shut off.

Though the boiler had not been accepted by Bailiwick, and Erg had not been paid for its installation, the hotel took charge and began operating it under a provision in the contract which read: "The owners shall have the right to take possession of or use any completed or partially completed part of the work."

Explosion Kills Workman

Later on, the contention was made that Bailiwick was operating the boiler "under the direction, and with the help and advice" of Erg Engineering when the boiler exploded some two months after installation. This accident killed a workman employed by a subcontractor to insulate the steam pipes. His wife, Mrs. Smith sued Erg Engineering and Bailiwick for damages. She received a $10,000 verdict against them at the hands of the jury. The trial judge set aside the verdict against Erg, but on appeal the circuit court reinstated it and Erg thereupon took the case to the supreme court of appeals of the state. That tribunal's opinion reviewed the facts and uncovered dark spots in the evidence.

The boiler's ownership and operating status were extremely hazy. It had been bought by Bailiwick, installed by Erg but exclusively operated and controlled by neither one nor the other. Both were labeled jointly responsible. Furthermore, as has been noted, the boiler had not been accepted by Bailiwick nor had the hotel paid for its installation. The burner, which had been bought by Erg, was of a type designated and required by Bailiwick.

Cause Not Determined

As might be expected, the causes of the explosion were never made clear but were subject to several theories. One claim was that "the explosion actually occurred in the breeching near the rear of the boiler." Another was that, due to a break in the main gas line, a pocket of air came through, extinguishing the fire in the combustion chamber as well as the pilot light. An accumulation of gas in the chamber exploded, touched off by heat in the chamber walls. A third solution of the mystery assumed that an excessive pressure in the gas line prevented the burner from properly operating. An expert witness testified that he saw the problem as a complicated train of small internal failings, chief of which was a quantity of air insufficient "to kill the pilot light". Still another authority believed there was "excess of gas in the air" and another gentleman was of the opinion that the pilot light was out "for some reason" that he "was unable to determine". The court stigmatized all these mouthings as "mere speculation or conjecture".

There was no doubt as to what killed Mr. Smith — escaping steam from a large pipe which was broken when part of the supporting wall was blown down. He was, as we have remarked, an employee of Erg's insulation subcontractor, and was working on the steam pipes about 15 ft from the boiler when the explosion took place.

The trial jury had been permitted to view the premises and to examine the boiler, burner and firebox. At that inspection, it was pointed out, and later testified to by a hotel employee, that steel supports were affixed to the boiler after the explosion. Admission of this evidence, as tending to show an effort after the event to correct a mistake in installation, brought objections from both the Erg and Bailiwick lawyers.

The questions involved in the appeal to the supreme court were substantially these: Was Bailiwick or Erg, or both, in control of the boiler's operation when it exploded? Has an inference of negligence been conclusively rebutted? Was admission of evidence relating to affixing of metal supports under the boiler "prejudicial error"?

Exercise Joint Control

From a practical standpoint, the significant thing about the supreme court's decision was not its failure to adopt any physical theory of the explosion, nor even its answers to the questions above posed, but the assumption, for the purpose of this opinion, that Erg and Bailiwick exercised *joint control*. The high tribunal could scarcely have done otherwise, in view of the evidence and the anomalous situation in which the heating contractor found himself. This assumption made Erg Engineering jointly responsible with Bailiwick for the boiler's operation and the explosion.

Luck, however, was with Erg. The supreme court found no evidence of negligence on that company's part, and reversed the lower court's judgment, granting Erg a new trial. Nevertheless, one of the justices dissented strongly. Though agreeing with his learned brethren as to joint control, he denounced the gas burner as "a dangerous instrumentality". He ruled that negligence on Erg's part "could be inferred from the proof of facts."

To Avoid Trouble . . .

Erg's troubles might have been avoided if there had been at the outset a clear-cut contract, with everything under single and exclusive control until the job was completed. Perhaps, if such a course had been followed, there would have been no explosion, no loss of life — in short, no case.

[Note: While this discussion applies to an actual case, it should be remembered that legal rules vary in different states]

QUESTION OF THE MONTH

How Heat and Ventilate Paint Spray Booth?

- *IF YOU DON'T HAVE the answer to a heating, piping or air conditioning problem, chances are someone else does — or can be helpful on part of it. That's the reason for HPAC's Question of the Month "idea exchange."*
- *YOU ARE INVITED to contribute a question for publication, or an answer to a published question. Please address your reply to the Editors, Heating, Piping & Air Conditioning, 6 N. Michigan Ave., Chicago 2.*
- *RECENTLY one of HPAC's readers asked about heating and ventilating a paint spray booth in a garage. The question was referred to B. R. Small, mechanical engineer for the Aluminum Co. of America, who has written on the subject of industrial ventilation previously. His answer is given here, following the question itself. Other comments for publication will also be welcome.*

I HAVE a question in connection with heating and at the same time ventilating an all-steel automobile spray painting booth 12 ft x 24 ft x 10 ft high. I cannot use an open flame in or near the booth.

I wish to use hot water run through about 2000 ft of black iron pipe radiators made of 1 in. pipe and an open return. I hope to heat the water with electric immersion heaters, as many as may be required, inserted in sides of a 30 gal insulated tank to bring the water quickly to the boiling point and in turn pump it while very hot through the radiators in the spray booth. The heater and pump are to be outside of the booth, far enough away from explosive and inflammable fumes for safety. This booth is not intended to bake the paint at all, but it is intended to heat the air to reduce the relative humidity and to raise the air temperature to about 80 or 90 F inside the booth. The booth is installed inside of the building with the air temperature maintained at about 65 to 70 F inside, but the air cools off rapidly as the exhaust fan is operated to exhaust the spray dust and paint fumes through the stack and then outside the building.

May I ask if this is practical, and — if it is considered to be practical — where may I make mistakes and where may I avoid them? When the paint job is finished, I wish this to cool off quickly or naturally as the case may be, by shutting off the electric heaters. The main building heating system is often off entirely, and it is too cool for good painting work, so that is why I desire to use a special heating unit for the spray booth only. We do not wish to use infra-red ray heating units.—M. V. L.

B. R. SMALL, Mechanical Engineer, Aluminum Co. of America offers the following comments as a solution to his problem:

"M. V. L." seeks an economical means to obtain more heat in a 12 ft x 24 ft x 10 ft high paint spray booth in order to hold the air temperature between 80 and 90 F for better paint drying. The booth is inside a heated garage building, and it is assumed that it is in full use by one or two painters not more than half of any working day.

The amount of exhaust air might best be set up on the basis of an exhaust fan installed at an elevation of 6 ft in the center of the rear end wall. With uniform air temperature in the booth, any open exhaust air flow is primarily in a horizontal direction at the height of the suction opening. If we consider the horizontal flow and the length of the booth as a duct, then 7500 cfm will provide a cross sectional velocity of about 100 fpm. This velocity would be the very lowest that would be acceptable and then only because of the expense of winter air tempering.

Hot water heat — as the owner points out — is perhaps the safest system for this application. Sufficient capacity should be provided to heat 7500 cfm of air to 90 F when supplied from the surrounding garage at a probable minimum of 60 F. This would require 250,000 Btu per hr, or 75 kwhr. In other words, 15 immersion heaters at 5 kw each would supply this requirement. However, to obtain electric power in this amount for even the larger garages may require new outdoor transformers, circuit breakers and the levying of a costly demand charge. A better heating medium might be No. 2 fuel oil — or natural gas — and a hot water boiler capable of producing 1650 sq ft of radiation.

The owner's proposed 2000 ft length of 1 in. iron pipe will be bulky to assemble and to install as a coil over which air must pass before it enters the booth so as to avoid hot spots. Furthermore, if pipes were hung on the two side walls, much of the air would bypass this heating surface.

To heat the booth, it is suggested that two one-row aluminum fin, copper tube blast heating coils be furnished, each having 10 sq ft of air face area. Each coil could be set in an opening cut in the booth side walls near the floor, at the end opposite from the exhaust fan. Through each of these coils a low velocity of 400 fpm flow of garage air is drawn into the booth at one end and then on to the exhaust fan at the far end. Thus, no severe dusty drafts are set up, and no explosionproof electrical installation is needed. The only requirement is to install tight garage doors on the open end of the booth and to make sure that the exhaust fan end is closed off. The low air flow resistance imposed by the blast coils may or may not require substitution of one size larger fan motor with the next higher standard motor speed.

With this arrangement, two streams of 90 F air will be entering the booth at the far corners, and it will flow past the work, to be drawn out by the wall fan. Thus, the best type of air flow pattern will be present — namely, air from the inlets flows past the men and toward the source of contaminant and then directly to the exhaust fan.

It is assumed that the painting in the spray booth involves a three hour job, perhaps four days a week. If the booth is heated to 90 F when the main heating plant is providing 60 F in the surrounding garage, the fuel cost will amount to about 33c per hr figuring 13c per gal oil cost. Electric heating by comparison will cost $1.10 per hour based on a 1½c per kwhr combined demand and power rate. If electricity could be bought for 1c per kwhr, then immersion heaters might be profitable because of the lower capital investment. In this event, the 250,000 Btu per hr would cost 73 cents. If power is already provided nearby in the building, then there is not much additional electrical investment. With either fuel, a hot water circulating pump is necessary and during maximum heating periods, the hot water should be delivered to the booth at about 200 F.—B. R. Small, Mechanical Engineer, Aluminum Co. of America.

READER ASKS —

How Can We Calculate the Overall Heat Transfer Coefficient for a Wall with a Combination of Mass and Reflective Types of Insulation?

"We have been confronted with the problem of calculating the overall heat transfer of a frame wall in which a combination of mass and reflective types of insulation is installed. In other words, when two unlike insulations are used in the same wall, how are the two different coefficients used in the calculation to determine the overall heat transfer coefficient?" — F.P.T.

[You are invited to comment on this question, giving actual examples if possible. Address the Editors, Heating, Piping & Air Conditioning, 6 N. Michigan Ave., Chicago 2].

G. W. T. Kearsley —

"Suggest Removing Reflective Paint"

This is with reference to the question about the skating rink piping problem in the Question of the Month department of the February HPAC.

As a possible solution to the problem, I would like to suggest that the reflective aluminum paint be removed over the expansion joints. This should permit the heat to travel downward to the cooling coils in the slab which in turn should cause the water to freeze at the joints in the same manner as at other locations. No doubt the aluminum paint strip is as wide as the brush used to apply it — possibly several inches — which has a considerable effect.

From the description of the problem, it appears that heat removal near the compressor house is slightly deficient from some other cause, and the problem shows up at the joints first.—G. W. T. Kearsley, Engineer, Oak Ridge National Laboratory.

Announce Big Indiana Shopping Center

. . . air conditioned, of course

Indiana's "largest shopping and community center" is to be built at a cost of $7 million by L. S. Ayres & Co., Indianapolis department store, and Landau and Perlman, Chicago business property developers, joint participants in the project. To be known as Glendale, it will be on a 45 acre site on the northern edge of Indianapolis, about 8½ miles from the heart of the city, and will include the first complete Ayres branch store and 44 other retail and service units.

All of the stores in the shopping center will be air conditioned.

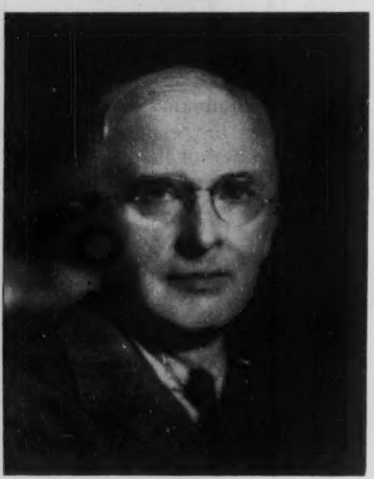
Each entrance to the Ayres store will have a protected vestibule to keep the cold air out in the winter and to retain the air-conditioned "coolness" in the summertime.

Victor Gruen & Associates, Inc., are the architects and engineers.

SAM LEWIS' PAGE

Consulting Engineer's New Work

. . . is only part of his activities. Plants and buildings make many changes as years roll by



SAMUEL R. LEWIS, consulting mechanical engineer and a member of HPAC's board of consulting and contributing editors since 1929, comments informally each month on practical heating, piping and air conditioning problems. This month, he describes the heating changes in a 40 year old hotel to indicate the sort of work that goes on in plants and big buildings. Mr. Lewis is a past president of the American Society of Heating and Ventilating Engineers and a recipient of its F. Paul Anderson award.

PERHAPS MOST of us think of the design of a new installation as the primary function of a consulting engineer engaged in heating, piping and air conditioning work. While such design is a major activity of the consulting mechanical engineer's office, the alteration, revision and modernization of existing installations may be equally —, or more — important.

The same is true of heating, piping and air conditioning contractors. I know of one such organization that installed the ventilation and air conditioning in a big building constructed in the late 1920's. There hasn't been a day since this building was finished that the contractor hasn't had men on the job there, revising and extending the duct installations, putting in improved equipment, and extending the air conditioning to serve more and more of the structure.

Many contractors are constantly at work, too, in big industrial plants on major maintenance of the heating, piping and air conditioning installations, repairs and replacements, alterations, and extensions.

I thought it might be interesting this month to say a few words about a big building which I — as a consulting engineer — have been concerned with for some 40 years. The particular changes in the heating of this building — a hotel — are not cited necessarily as "recommended practice" for universal application, but as examples of the sort of work more-or-less constantly going on in big plants and buildings. In other cases, the factors might of course have warranted some other type of equipment — it's part of the consulting engineer's job to arrive at the proper solution for each individual case.

This particular example refers — as mentioned — to some 40 years of my intimate connection with a successful hotel in a large city, and the changes in mechanical equipment that have been developed since the original eight story part was supplemented with a newer 18 story addition.

Originally coal was brought to the boiler room, which was nearly a block inward from the street, on a big transfer car. The old horse-drawn wagons brought the coal to a hatch in the sidewalk and it fell into a hopper shaped car that held up to 10 tons. The car could be pushed across the basement on steel rails and a gate in its bottom permitted the coal eventually to fall into the storage bunker. Men then shoveled the coal into a wheelbarrow, trundled it in front of the boilers, and opening the fire doors, could throw the coal into the boilers above the grates. The cold coal was spread over the top of the hot, partly burned, earlier fuel bed, and frequently it was stirred up by a fireman at one end of a slice bar.

Of course, black smoke polluted the air at the chimney top — but in those primitive days no one cared.

The old hopper car long ago was succeeded by an endless chain elevator with many relatively small steel buckets. A steam engine (later replaced by an electric motor) moved the chain slowly and continuously, so that each bucket would rise through the coal pile under the sidewalk, lifting perhaps 100 lb every minute, then turning to run horizontally over to hoppers in front of the boilers.

From the hoppers the coal would pass through a gate above each stoker. The stoker would introduce the cold coal into the hot combustion chamber in such a manner so as to not agitate the fuel bed excessively, and so as not to overdo the admission of unheated damp air. The smoke production was reduced and a few firemen, formerly employed to shovel coal, obtained better jobs elsewhere. I hope that the slice bar was sold for junk. The metal buckets and chains of the clanking old conveyor, however, succumbed to corrosion.

The next change made in this building was the installation of fuel oil burners and oil handling apparatus. A relatively small pipe was extended into the old bunker from the street and a hot water pipe was encased with the long horizontal oil pipe to keep the oil happily warm. Later, the hot water pipe was superseded with a warm electric cable, wound around the old pipe. The large basement rooms originally reserved for passage of the hopper on wheels, and the tunnel and shafts for the bucket conveyor, became available for other use. The old bunker rooms were made into oil storage tanks by welding in the necessary steel plates and supporting columns.

The combustion chambers of the boilers were made much higher and the preheated oil and just enough preheated air were introduced mechanically under control. Instruments were provided to indicate, to record and to adjust the proportions of fuel, air and the resultant character and temperature of the gases.

There came a time when the boilers themselves became weary and when the lining of the chimney commenced to fall in.

The space in the basement occupied by the boilers became especially valuable for other purposes. The public service company had developed a network of underground steam mains and offered to furnish steam for heating as well as electric energy for power. The cost of metered steam was less than that for making the steam in the old boilers and the space gained was all profit. The important dining room above the boilers always had too warm a floor and with the boilers out, would now be comfortable. The condensate from the public service steam was trapped through an exchanger to heat the domestic water. The condensate was employed also for many nonpotable soft hot water services.

There were some relatively small demands for extra-hot steam, as in the valet shop. Since the public service steam temperature, for economy in transmission, was kept as low as possible, the public service company furnished electric energy to operate compressors mechanically, to compress the valet shop steam up to the pressure corresponding to 300 F. The steam and the electric power both are supplied by the same company.

This hotel has some 500 guest rooms that are cooled by refrigeration on hot days. Each room has mechanical ventilation, based on enough new air from outside to dilute the odors. The cooling system and the heating system are independent each from the other, so that some cooling may be in effect on a warm morning on the sunny or east side of the building at the same hour that some heat is being delivered on the shaded west side.

Let me say again — in conclusion — that the purpose of this recitation is not to recommend the same alterations or changes in other buildings. What to do in any specific installation depends on the particular engineering factors involved. I did think, though, that it would be interesting to review the sort of changes that are made in a building of this kind over a period of some years.

In another case, of course, the consulting engineer's analysis might well indicate that the building's boilers should be replaced, and that they should be fired with a modern, properly engineered installation using coal, gas or oil — or a combination of fuels.

Many Applications for Electric Space Heating

. . . 600 jobs in St. Louis

THE "STORY of electric space heating" was presented in a series of meetings sponsored recently by the Union Electric Co. of Missouri, St. Louis, which were attended by heating and air conditioning contractors; consulting engineers; building contractors; electrical contractors; FHA, VA and electrical inspectors; and equipment suppliers.

A booklet published by Union Electric — entitled Guide to the Use of Electricity for Space Heating in Homes, Factories, Commercial and Farm Buildings — was given out at the meetings. It describes electric space heating methods and the types of equipment for both complete space heating and for auxiliary or supplementary heating. According to the booklet, there are more than 600 installations of complete electric space heating in the St. Louis area.

For complete or "total" electric heating of a room or building, the booklet stresses that adequate insulation is a "must" for operation at minimum cost, recommends the equivalent insulating effect of 4 to 6 in. of mineral wool in ceilings, 4 in. in side walls, and 4 in. in all floors above unheated basements, garages or other unheated areas. It recommends also 2 in. of special insulation (interior perimeter seals) around the edges of the structure where concrete floor slab construction is used with no basement. All windows should be double pane — or, if single pane, tight storm sash and storm doors should be used. Cracks should be caulked, and weatherstripping should be used on all windows that open, and on all outside doors.

Electrical capacity and seasonal costs for an installation should be calculated, and the booklet recommends consultation with a competent heating contractor, heating dealer, heating equipment distributor or an architect. The booklet points out that operating costs for electric space heating are higher than for combustible fuels, but that operating costs are but a part of the total cost story. Total cost must include the initial investment, fixed charges and maintenance, and also the cost of electricity for operating motors, fans and blowers. When all costs are figured — says the booklet — the "owning costs" of electrical space heating may be competitive with other methods.

The booklet suggests several applications of electric heating in stores, offices and factories:

- Along the outside walls of an office where employees complain of being cold.
- Cashiers' booths or filling stations where space is limited.
- Doctors' offices.
- Lavatories, shower rooms and locker rooms where higher temperatures are required for comfort.
- Conference rooms, watchmen's quarters or locations where other heat is not continuously available.

ANYTHING CAN HAPPEN

Mac and His Friends Review Progress of Power Piping

By Bill Dopp

• *Almost anything can happen when you're in the engineering, operating, contracting or sales ends of the heating, piping and air conditioning industry. The objective of this more-or-less regular editorial feature in HPAC is to discuss practical problems that need solving — and ways to solve them.*

Bill Dopp has had 40 years of experience dealing with piping, including a long stretch of service as a sales engineer. He is devoting some of his present leisure to drawing on his many piping experiences, as he does in this review of the progress of power piping in the last 25 years . . . .

MARTIN MACVANE balanced himself against the swaying of the speeding streamliner. He didn't see the two smiling figures near the end of the club car until one of them hailed him: "Hi, Mac. Where do you think you're going?"

Mac looked around to discover two of his old friends. He greeted Wilbur Wood, chief engineer of a large power plant and Benton Holmes, research director of a valve manufacturing organization. [The names are fictitious.] "Where is the party?" he asked happily. "I'm headed for a few weeks of sun on the Arizona desert." He took the empty chair beside them and asked, "What goes? Another convention?"

What Is Biggest Advance?

"No," said Ben, "we're going out to the coast to get a look at some new valves that have recently been installed. They are the latest thing for high temperature, high pressure service. It's the greatest advance that has been made in piping in almost a hundred years."

"You're taking in a lot of territory there, Ben," laughed Wilbur Wood. "I am inclined to think that the advent of the welding ell could be shown to be even more important. Look what they've done for the whole piping field. They really revolutionized the application of piping when they appeared in the late twenties."

Mac had a broad smile on his face. This trip was going to be interesting. Here was an argument started before they had been together five minutes. "You're both wrong," he declared. "What about the welding technique? Without that, neither your fancy valves nor the welding ell would have had a chance. Twenty-five years ago, all of you engineers were afraid of any kind of a weld. Now it is impossible to get along without welds in almost every pipe line that you erect. I'm for welding as the most important advance in the last twenty-five years at least."

"You've got something there, Mac. When I think back, I'm amazed at what has taken place in this last twenty-five years. There has been as much advance in that time as in the preceding seventy-five." Wilbur Wood used his hands freely in expressing himself. "Look at what has taken place in the construction of boilers and turbines."

"You're right there," agreed Ben. "It was in the early twenties that things really got going. That was when pressures began to skyrocket."

Temperature Forces Progress

"About 1928 we thought we were going all out in pushing temperatures up to 800 degrees," recalled Mac. "Don't you think that this rise of temperature has had more to do with the development of piping and valves than the pressure rise? After all, we had high pressure water and air long before that."

"It is the temperature rise that has forced progress, Mac," declared Wilbur. "We got steel valves and flanges and we used to talk about manganese steel as though we knew something about it. Seven hundred and fifty degree steam was hot stuff then. I recall when L. W. Spring first came out with the curves on the reduction of tensile strength of metals due to temperature, and how surprised we were. That led right into the development of new metals and the study of materials that would resist creep."

"Creep is a different thing," said Ben. "It took all of us a long time to get the idea of stress-temperature deformation through our heads. It was the work of the laboratory men that gave us the new metals. Do you know, without the constant painstaking efforts of the many industrial laboratories, we would be helpless to make any real progress? First, they gave us carbon-molly. That was just about twenty-five years ago. We thought that we were all set for the rest of time. The turbine people kept wanting higher temperatures to improve efficiency and the boiler makers kept right up with them. Nobody suspected that there was a fly in the ointment until the Springdale failure. Boy! Did that set things off? Graphitization scared us worse than the failure of carbon steel bolts."

"Mac, I wonder if the development of better materials isn't a more important factor in progress than your welding technique?" inquired Wilbur. "Seems to me that it was the new metals that forced the other development."

"Which came first, Mac?" demanded Ben, "the hen or the egg?" They settled themselves more comfortably for what promised to be a long and interesting discussion.

Piping Design Changes

"Things were changing in the design of pipe lines, too," asserted Wilbur. "From the old ponderous loop headers we went to the single straight header, some of them a hundred feet or more long. Then an engineer designed a plant with a main steam header that was less than ten feet long. Everybody thought he had gone crazy. Funny how that idea took hold, though. Soon they were all doing it. Some of the steam plants designed with a series of short headers tied together with big double offset expansion bends are still going strong."

"That was before the day of the one gut layout — one boiler and one turbine," declared Mac. "I'd guess that it is the history of the turbine that laid the foundation for the development of power piping. Some of the verticals got to be pretty big. Then the first of the horizontals appeared. Everyone held his breath when they started one of those things. The fight was on between the impulse and reaction types of turbine, and the boiler makers were having their own little battle over sidewalls and chain grates versus underfeed stokers. Really, when you look back, a merry time was had by all." Mac smiled over the recollection. "Three piece reheat monsters and topping turbines had their day, too. With the demand for power going up all of the time and bigger plants appearing in all parts of the country, the piping industry was hard put to keep up. However, don't forget that without the piping and valves, none of this progress would have been possible." Mac grinned as he paused. "You can't carry steam in a bucket," he averred.

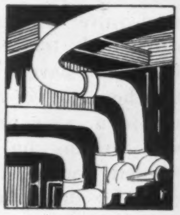
"What a world we live in," mused Ben. "Nowadays the atom bomb gets all of our attention. We forget what a wonderful progressive age we have been living in all along. When you recall the old-time power plant, the modern power plant of today seems like an unbelievable dream. I guess Mac's right. It's the piping and valves that have made all of this possible."

Flexibility, Pressure Drop

"Ben, you lab fellows have done something just as important as giving us new metals," argued Wilbur.

"What's that?" demanded Ben curiously.

"Two things, I should say," replied Wilbur. "One is accurate pipe flexibility data to take care of these high temperatures and pressures and another that's just as important — pressure drop information so that we can properly size our piping. We used some pretty crude guess-work in engineering design twenty-five years ago."



"The publication of the Code for Pressure Piping in 1935 proved to be very stimulating in that direction," replied Ben. "The subject of a piping code had been in the minds of engineers for a long time. The standardization work that had been done by the American Standards Association emphasized the need for some kind of national piping rules. Much of the work on flexibility came from the same source as the final code requirements. Once limits were set, it became necessary to provide sufficient means for staying inside those limits."

"They haven't come to any general agreement on this matter of flexibility yet, have they, Ben?" asked Mac.

"That gets a yes-and-no answer, Mac," Ben grinned. "The present formulas are a sound working basis, but there is a task force now at work trying to develop procedures and formulas that will be suitable for the new higher temperatures that we are beginning to use. When you get into the 1100 degree class, things really begin to happen in piping. It would not be so bad if the pressures were lower, but 2500 pound steam at 1100 degrees introduces problems of strength and flexibility which may yet lead to the development of entirely new metals again. You see, far as we have come in the last twenty-five years, we still seem to have a long way to go." Ben shook his head and shrugged his shoulders as he added, "Who knows where we are going?"

"Again it's the high temperature that is making it tough for you valve people, isn't it, Ben?" asked Wilbur.

More Metal Changes Made

"Yes," asserted Ben. "We have to keep ahead of what the engineers are doing. For example, when one metal came into the picture for use as trim in steel valves, we thought that we had found the answer to all our problems. A little experience with its tendency to soften under the effects of high temperature made us go on the hunt for new material for valve trim. Some new types seemed to be the immediate answer until we tried to operate with high temperature steam. The stuff galled like nobody's business, but in the oil lines it proved to be the right answer. So the oil industry adopted it. It's great for stem material, too, so long as Mac provides us with a stem packing that won't pit the stems the first time that they get wet.

"Consider another trim material. For steam at almost any temperature, it's nearly perfect — provided it is properly manufactured. Nearly everyone in the industry knows how to do that now. But when it gets into the presence of high temperature boiler feedwater, it sets up electro-chemical corrosion and really goes to town. We have seen many valves that looked as though the rats had chewed them. They were valves that had been in boiler feed lines but had never been used as valves. You can hardly believe your eyes when you see one of them." Ben stopped to greet an acquaintance. "You never can tell what a customer is going to do with a valve. That's why they had to give up that material as a seating material. Sure as dawn, somebody would put one into a feed line and get into trouble in no time." He paused again. "You never can tell when what seems to be a perfect metal will let you down. We are always on the lookout for something better and more stable for these high temperatures."

Gaskets Have Changed, Too

"Well, Mac, we finally had to give up your gaskets for these high temperatures, too," laughed Wilbur. "When a ring joint failed, we really were in trouble. The first time I got up against the quenching effect in a high temperature steam line, I thought that I had gone nuts. We had a big valve in the main steam line that was perfectly tight. All of a sudden, one side of that ring joint bonnet would begin to spout high temperature steam and keep it up for several minutes. Then the blamed thing would snap shut and be perfectly tight again. After that happened several times, it would begin to really leak and we would have to take the line out and repair the valve. No one seemed to know what was going on. I'm sure that I didn't."

"It took us a long time to realize that a difference of one hundred degrees in the temperature of steam in a line was like a dose of cold water on your neck," Ben declared. "That small difference between the two sides of a pipe can contract a flanged joint enough to open the hot side. A slug of water in a hot line has been known to open a tongue and groove joint enough to blow one of Mac's gaskets all the way across the boiler room."

"Gaskets and packing have gone through the process of evolution, too," said Mac. "In my younger days a red rubber gasket was practically all that we knew. It has served a long and useful life and bids fair to stay around for a long time yet. Then came the asbestos sheet gasket which is also still with us. It has been modified in many ways. Combinations of metal and asbestos have been made in a wide variety of forms — flat metal enclosed asbestos, multiple layers, spiral wound and many others. As temperatures went up and bolting became heavier, the gasket problem became more and more difficult. I recall the first time that I had the nerve to use a flat soft steel gasket on a smooth tool finished flange for 600 pounds of 850 degree steam. A young fellow recommended it and finally sold me on the idea. I was actually surprised when it proved to be the perfect answer for the service." Mac smiled broadly as he added, "It would still be the answer if you fellows didn't weld your lines."

Valves Have Developed

"Mac is still plugging away at the idea of the importance of welding," mused Wilbur. "But, Ben, what about valves during this past quarter century? They have changed a lot, too, haven't they?"

"You bet they have," replied Ben earnestly. "The valves we were making when the first of the 1500 pound turbines came on the market in the late twenties are a far cry from the slick, streamlined beauties we turn out now."

After a moment, Ben continued. "In the last twenty-five years, we have seen the establishment of the plug type globe valve as a medium for the control of all kinds of fluids. We have seen the advent of the small steel valve for use with high pressure, high temperature steam and water and have witnessed the evolution here, too, of a new type of bonnet joint. We find now a type of seal welding on these joints that remind you of the famous sarlun joint for steam lines."

"Mac, why have we always had such a hard time with these small steel valves? I never could get a gasket that would stay tight in them." Wilbur addressed Mac with a serious frown.

"Because you never gave the gasket a chance," replied Mac. "Perhaps you do not realize it, but that small valve takes a real beating in service. You let condensation collect in the line and cool the valve body, then you open the valve only partially. Aside from giving the seating surfaces a hard time with the close throttling, you begin to heat up the inside in such a way that the heating is not uniform. The whole structure becomes distorted. Before the entire valve has become thoroughly heated, you close it again. No gasket can keep up with that kind of unequal expansion and contraction, in my experience."

"An important advance in valve design," declared Ben, "is the pressure seal bonnet joint. Instead of trying to hold the lid on the valve body against the pressure, we take the pressure inside the valve and force it to seal the joint by pressing the bonnet up against a soft steel gasket ring. It's like the old boiler handhole plate — the greater the pressure the tighter the joint."

Welding a Big Factor

"I've no quarrel with the wonderful advances that the valve people have made in meeting these new situations," said Mac. "All I'm saying is that almost none of these power piping developments we have been talking about would have been possible if it had not been for the improvements in the welding techniques which have come about." Mac emphasized his point with a vigorous tapping of his finger on the arm of Wilbur's chair. "Twenty-five years ago you plant engineers would not stand for the welding of a low pressure water line."

"You'll have to agree that Mac is right in that, Wilbur," interposed Ben.

"I know it took a long time to get good welds — ones that we could rely on — but I think Mac is a little hard on us for not wanting to stick our necks out in those early days of welding." Wilbur's answer indicated a faintly apologetic tone.

"Look at things today," suggested Mac. "We have developed techniques for welding almost any kind of metal or alloy. On some of the recent power jobs the pipe lines of chrome-molly steel were three and a half inches thick. These welds were made without any difficulty. I'll beat you to the thought, Ben, without the X-ray and the gamma ray capsule we would not be quite so sure of ourselves, but after all that's part of the technique."

"Progress shows in every line," said Wilbur. "I suppose, Mac, you would contend that your welding technique has helped to make this perfectly heated and air conditioned car possible, too."

"And so it did," asserted Mac, "not only the heating and air conditioning but the car itself. It's an almost entirely welded job." Mac got up. "I'm hungry fellows, let's eat."

"I guess you're right about the welding, Mac," declared Ben. "Come on Wilbur, better concede the palm to Mac."

"Okay on both counts, You be our guest for dinner, Mac. We'll continue the progress if not the discussion. It's been a lot of fun," Wilbur said, as they left the car.

Bill Dopp writes about Martin MacVane's piping experiences each month in Heating, Piping & Air Conditioning.

COOLING LOAD ESTIMATE FORM
For Room Air Conditioners

Section 1. Instructions

1.10 This *Cooling Load Estimate* is suitable for comfort air-conditioning jobs not requiring specific conditions of temperature or humidity and is recommended practice for members of the Room Air-Conditioner Section of the Air-Conditioning and Refrigeration Institute.

1.20 Summer outside design temperatures are listed for the principal cities of the United States in the *Heating, Ventilating, Air Conditioning Guide,* published by The American Society of Heating and Ventilating Engineers. This form may be used for all cities in the United States except the few where the outside design temperatures are appreciably above 95 F dry bulb and 78 F wet bulb. In these cases the load estimate should be modified or other forms used.

1.30 Insert the information called for in the job identification lines at the top of the Estimate Form.

1.40 Measure and sketch the room, showing the location and size of windows, doors, and other openings. Carefully determine directions and indicate north on the sketch by an arrow. For most jobs, each square of the sketch can represent one foot of room measurement.

1.50 The numbers of the following paragraphs refer to the item numbers of the Estimate Form:

1. Under *Quantity,* insert the total square feet of window area for the unshaded exposure having the largest cooling load. For windows shaded by inside shades or inside venetian blinds use the factor for *Inside Shades.* For windows shaded by outside awnings or by both outside awnings and inside shades (or venetian blinds), use the factor for *Outside Awnings.* Only one number should be entered in the right-hand column for Item 1.

   Note: For all items, the *Quantity* (in this case, the area in square feet), multiplied by the proper *Factor,* gives the load for that item in *Cooling Units.*

2. Insert the total square feet of window area of all windows not included in Item 1.

3. On Line 3a or 3b, insert the length of the wall that had the largest sun load in Item 1. The total length of all walls and partitions not incuded in Line 3a or 3b should be inserted on Line 3c. (The factors are based on a wall 9 feet high and are applicable to walls of usual heights and average construction. An uninsulated frame wall or a masonry wall 8 inches or less in thickness is considered *Light Construction.* An insulated frame wall or a masonry wall 12 inches or over in thickness is considered *Heavy Construction.*)

4. Insert the total square feet of roof or ceiling area on Line 4a, 4b, 4c, or 4d. (Use one only.)

5. Insert the total square feet of floor area. Neglect this item if floor is directly on ground or over unheated basement.

6. Insert the number of people who normally occupy the space to be air-conditioned. The factor includes the nomal cooling load per person and approximately 15 cfm of ventilation air per person.

7. Insert the total number of watts for lights and electrical equipment that will be *in use* when the room air-conditioner is turned on and the sun is shining.

8. Insert the width of any door or arch that is continuously open to an unconditioned space.

9. Add the loads of Items 1 through 8. This is the total load in cooling units (Btu per hour). A room air-conditioner or room air-conditioners with capacity equal to or greater than this load should be selected.

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COOLING LOAD ESTIMATE FORM FOR ROOM AIR CONDITIONERS

Section 2. Estimate Form

Recommended Practice for Members of Room Air-Conditioner Section of Air-Conditioning and Refrigeration Institute. This estimate is suitable for comfort air-conditioning jobs not requiring specific conditions of temperature and humidity.

Customer.. Buyer..
Address.. Space to be used for.........................
Estimate by.......................... Date.................. Approval.......................... Date..............

Item	Quantity	Factor		Cooling Units
		Inside Shades	Outside Awnings	
1. Windows Exposed to Sun, Facing*				
a. East, Southeast, or South	..........sq ft	45	25	....
b. Southwest	..........sq ft	65	40	....
c. West	..........sq ft	100	60	....
d. Northwest	..........sq ft	35	25	....
*Use only the exposure with the largest load.				
2. Windows Facing North or in Shade (Include all windows not included in Item 1.) .	..........sq ft	14		....
3. Walls (based on lineal feet of wall)				
a. Light construction, exposed to sun* . .	..........ft	90		....
b. Heavy construction, exposed to sun* .	..........ft	50		....
c. Shaded walls or partitions (Include all walls not included in 3a or 3b.) . . .	..........ft	30		....
*Use for only that exposure used in Item 1.				
4. Roof or Ceiling (Use one only.)				
a. Roof, uninsulated	..........sq ft	16		....
b. Roof, with one inch or more insulation .	..........sq ft	7		....
c. Ceiling, with occupied space above . .	..........sq ft	3		....
d. Ceiling, with attic space above . . .	..........sq ft	10		....
5. Floor (Neglect floor directly on ground or over unheated basement.)	..........sq ft	3		....
6. People and Ventilation—Number of people	....	900		....
7. Lights and Electrical Equipment In Use	.... watts	3		
8. Doors and Arches Continuously Open To Unconditioned Space (lineal feet of width)	..........ft	300		....
9. Total Load in cooling units to be used for selection of room air conditioner (s) . .	xxxx	xxxx		....

*ROOM SKETCH

*Indicate North by Arrow

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Heating, Piping & Air Conditioning

THE AMERICAN SOCIETY OF HEATING AND VENTILATING ENGINEERS

JOURNAL SECTION

The object of the Society is to advance the arts and sciences of heating, ventilating, cooling and air conditioning, and the allied arts and sciences, for the benefit of the general public, to encourage and conduct scientific research, and to cooperate with other organizations having the same or similar objectives.

Filtration of Microorganisms from Air by Glass Fiber Media

By H. M. Decker,* J. B. Harstad, F. J. Piper,** and M. E. Wilson,***
Frederick, Md.

SUMMARY — Three types of glass filter media have been evaluated. A 99 percent removal of bacteria and viruses from air can be obtained by using two spun glass filter pads. This arrestance is satisfactory for general building exhaust in applications such as in hospitals and in industrial concerns. Mineral filter papers gave much higher arrestances than spun glass pads and may be used in specialized circumstances such as in some research institutions where organisms may be handled in large numbers and might be released, accidentally or deliberately, into the air. The efficiency is such that consideration may be given to using these filter papers in locations such as hospitals and educational institutions where more expensive air incineration systems are now in use. The effectiveness of the various types of filter media is shown by tests reported.

THERE IS AN increasing need for highly effective air filtration systems in hospitals, certain industrial installations, and in research laboratories in which it is required that air be relatively free of microorganisms before, during, or after a process. A survey of laboratory acquired infections in the United States, conducted by Sulkin and Pike[1], shows a total of 1,342 infections presumably acquired in the laboratory. Concomitantly, it has been found that common laboratory techniques such as pipetting from vessels or mixing in blending devices permit the escape of organisms into room air, with subsequent danger to laboratory personnel. Only recently has the bacteriologist become aware of dangers that may be inherent in many laboratory operations previously considered safe.

This paper gives a brief review of work that has been reported regarding the use of glass fiber media in removing microorganisms from air, and describes recent work involving the use of new types of filter media.

Glossary

bacteria	a widely distributed group of one-celled microorganisms, some of which are disease producing.
bacteriophage	a virus organism which is a parasite of bacteria.
blender	mechanism used to mix organisms into solution.
liquid impinger	a sampling device used to collect organisms from the air by passing air through a liquid confined in a vessel.
pipetting	the act of drawing and releasing a liquid through a narrow glass tube.
shaking machine	a mechanical device used for shaking flasks containing bacteria in a liquid growth medium.
sieve sampler	a sampling device used to collect organisms in the air by impingement of the organisms onto a growth medium.
spore forming bacteria	bacterial organisms which develop a tough investing cell wall, and possess great tenacity of life.
viruses	extremely microscopic agents, some of which cause disease.

Review of Past Progress

A paper concerning the removal of bacteria and bacteriophage from air by electrostatic precipitators and

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**Bacteriologist, Chemical Corps Biological Laboratories, Camp Detrick.

For presentation at the Semi-Annual Meeting of THE AMERICAN SOCIETY OF HEATING AND VENTILATING ENGINEERS, Swampscott, Mass., June 1954.

[1] Exponent numerals refer to References.

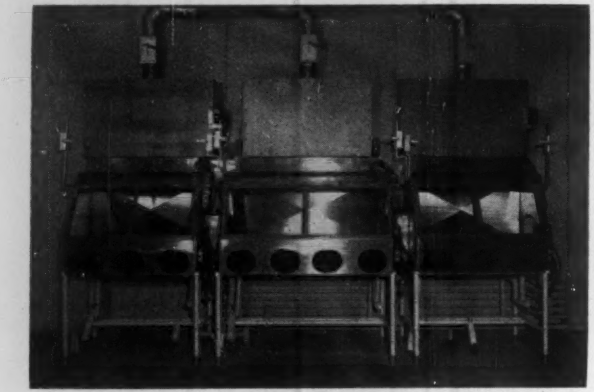

Fig. 1—Bacteriological safety cabinets

spun glass filter pads was presented by the author in 1951[2]. It was reported that two ½-in. pads of spun glass having an average fiber diameter of 1.28 microns showed an average arrestance of 99 percent against clouds of *Serratia indica* and *Escherichia coli* T-3 bacteriophage atomized into the air stream by means of an all-glass direct-spray, peripheral air jet atomizer designated in Reference 3 as a Chicago type nebulizer because it was patterned after one of those used at the University of Chicago Toxicity Laboratories. Biological material from this nebulizer is not always unicellular, because agglomeration of organisms may occur during or after release of the aerosol. *S indica* is a harmless, elongated bacterial organism about one micron in length and one-half micron in thickness. *E coli* T-3 bacteriophage is a harmless virus organism, somewhat spherical in shape, which ranges in size from 0.02 to 0.05 microns. Since publication of the 1951 paper[2] reporting the use of spun glass filter media, such media have been found useful not only in general exhaust systems, but also in specialized apparatus and equipment such as bacteriological work cabinets,[4] shaking machines, and animal cages (Figs. 1, 2, and 3).

Because of the possible creation of a biological aerosol while changing or removing contaminated filters when the resistance becomes excessive, bacteriological safety cabinets were designed and fabricated with a spun glass filter system which may be decontaminated in place prior to removal of the filter. The addition of three 750-watt strip heaters to the filter system permits heating the filter interior to 200 C (392 F). Time temperature studies have shown that after the interior of the filter has reached 200 C, an exposure of 20 min is sufficient to destroy very resistant spore-forming bacterial organisms such as *Bacillus globigii*. Infection of personnel while changing filters is therefore eliminated.

It has been reported by Leavell and Amoss[5] that brucella, the causative organism of brucellosis, can be isolated from the feces and urine of infected animals. This naturally indicates the possibility of airborne infection from infectious animal cages. To minimize this danger, several research institutions are ventilating the air through spun glass as it enters and leaves the cage. Use of the glass filter serves several purposes: (1) provides the animals with clean air; (2) lowers the possibility of cross-contamination between cages; and (3) in the event of a failure of the mechanical air supply system, contaminated air does not escape, but the animals still receive enough circulation of the air through the filters to prevent suffocation. Fig. 3 shows a photograph of the ventilated animal cage.

Another adaptation of spun glass has been its application to shaking

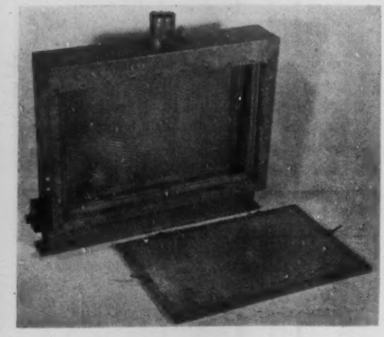

Fig. 2—Bacteriological safety cabinet spun glass filter unit

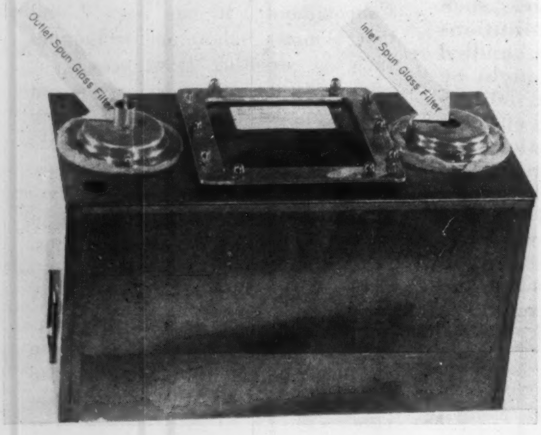

Fig. 3—Ventilated animal cage

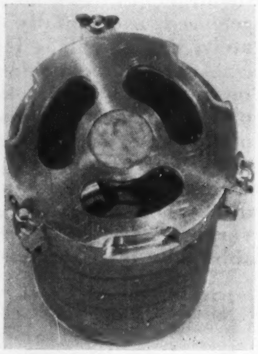

Fig. 4—Shaking machine container

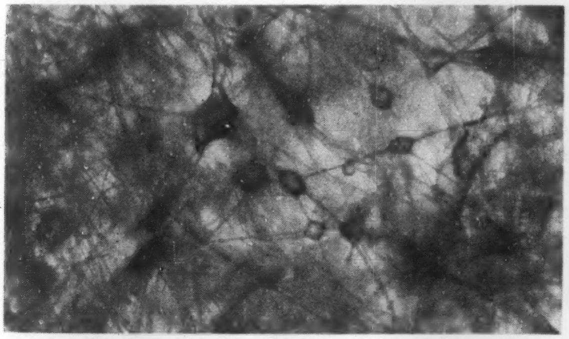

Fig. 5—PF 105 spun glass filter media
Fiber diameter (average) 1.28 microns

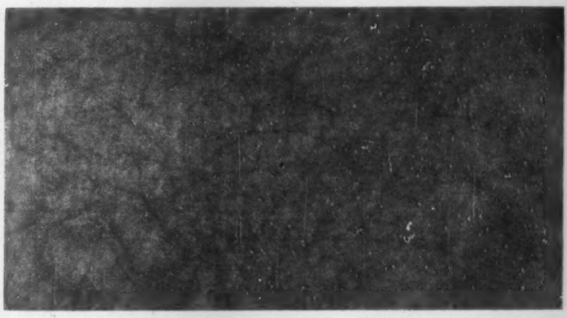

Fig. 6—Type E glass filter paper
Fiber diameter range 0.2 to 1.5 microns. Average diameter 0.5 to 0.75 microns. Melting point 1450 F

machines. To biologists and bacteriologists, the breakage of culture flasks on a mechanical shaker is a problem which becomes a hazard in laboratories working with pathogenic agents. Loss of plugs from the culture flasks being shaken has also been reported. The possibility of accidentally dropping a flask during transfer must not be overlooked. To avoid the dangers from such accidents, a shaking machine container has been constructed to completely enclose the flask, and yet provide sufficient air through a spun glass filter for satisfactory bacterial growth. Fig. 4 illustrates this type of container; various modifications are possible.

The data and application of glass filter media presented before have been confined to spun glass pads varying in thickness from ½ to 1 in. As reported in earlier work, two ½-in. pads of 1.28 micron size spun glass removed at a linear air flow of 20 fpm, an average of 99 percent of the bacteria and 99 percent of the virus organisms. It was felt that efficiencies of this range were entirely adequate for exhausting air from rooms where one would expect to find only a few infectious microorganisms. Actually, none should be released to the room air. The installation and use of the filters should be regarded as a safeguard against infection of personnel in the surrounding community in the event of an accident and ultimate release to the general building exhaust system.

Exhaust air filters with arrestance efficiencies in excess of 99 percent should be sought for specialized apparatus in which significantly infectious bacterial aerosols are accidentally or deliberately created, and for rooms in which infectious organisms are handled in unusual amounts. At present, air from such locations is often passed through an air incinerator.

Current Developments

A new glass fiber filter paper originally developed jointly by the Department of the Navy and the National Bureau of Standards is now being produced commercially. This filter media is as thin as coarse paper (10 mils). The fibers are known commercially as type E Glass Micro Fibers. They have a melting point of 1450 F and an average diameter of 0.5 to 0.75 microns. A second new type of filter paper is being developed by a research and engineering organization. This second type is composed of a mixture of glass fibers and asbestos fibers. Figs. 5, 6 and 7 show the fibers as they appear in the 1.28 micron size spun glass filter pads and in the two new glass filter papers. All three have been tested to determine comparative efficiencies in the removal of bacteria from an air stream. The 1951 ASHVE paper[2] reported an average arrestance of 99 percent of *S indica* and *E coli* bacteriophage T-3 when using two ½-in. spun glass filter pads at a linear air flow of 20 fpm. Since

Table 1—Efficiency of Glass and Asbestos-Glass Filters in Removal of *S Indica* from an Air Stream

Filter Material Evaluated	Air Flow Linear Fpm	Resistance In. Water	Number of filters[a] evaluated	Penetration per 100 million organisms recovered before filter
Glass type E filter paper	20	3.2	7	2
	10	1.5	5	1
Asbestos Glass paper	20	3.1	5	28
	10	1.5	5	140

[a] Each filter was tested a minimum of 10 times.

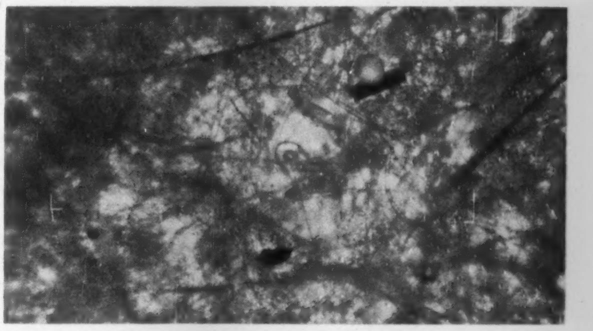

Fig. 7—Asbestos glass filter paper

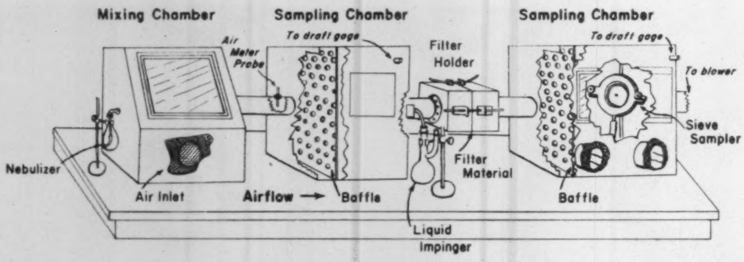

Fig. 8—Air filtration test unit

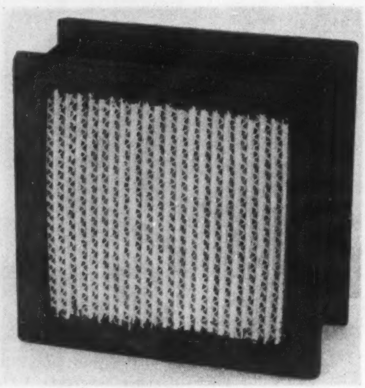

Fig. 9—All glass filter unit

that time, glass paper filters have been evaluated.

Experimental Methods

S indica was used to evaluate the efficiency of the filter papers. The test equipment is illustrated in Fig. 8. The organisms were nebulized into a cloud chamber where the cloud of bacteria was mixed with air, then passed into a pre-filter sampling chamber, through the filter at face velocities of 10 and 20 fpm into a post-filter sampling chamber, and finally exhausted by means of a blower to the outside air.

The air was sampled in front of the filter by means of liquid impingers constructed with a critical orifice which permitted air to be drawn through the collecting medium at approximately 0.5 cfm. The collecting medium in the impingers consisted of 20 ml nutrient broth and 6 to 8 drops of olive oil. One-tenth ml of the sample was streaked on a corn steep agar plate. In addition, one ml samples from the liquid impingers were serially diluted and one-tenth ml samples of the dilutions were streaked on plates for incubation and counting. Sieve samplers containing corn steep agar petri plates were used to sample air after it had passed through the filter.

Results

The efficiency of the filter paper was determined by sampling the cloud concentration before and after the filter. The results of the test are shown in Table 1. At an air flow of 20 linear fpm, penetration of *S indica* through the type E glass filter paper was two organisms from each 100 million test organisms recovered in front of the filter. At an air flow of 10 linear fpm, the penetration was 1 organism. With the asbestos glass paper, at an air flow of 20 linear fpm, the penetration was 28 organisms per 100 million test organisms. When the air flow through the asbestos glass paper was reduced to 10 linear fpm, the penetration increased to 140 organisms. The increase in penetration from 28 to 140 probably results from the lesser impingement of the organisms on the fibers at the lower velocities.

Conclusions

The filtration arrestance of the three filter media is very high and indicates possibility for wide practical application of these filters. Results of the authors' earlier work showed that two ½-in. pads of 1.28 micron size spun glass at a linear air flow of 20 fpm removed an average of 99 percent of the bacteria and virus organisms. It was felt that this type of air filtration system would be satisfactory for general building exhaust as in hospitals and in industrial concerns. However, in specialized circumstances such as in the case of some research institutions where organisms may be handled in large numbers or in apparatus in which significantly infectious bacterial aerosols are accidentally or deliberately created, a greater arrestance is necessary.

A highly efficient mineral filter paper is now available that can be easily used at high temperature. It is fire resistant, does not disintegrate when wet, and can be biologically decontaminated by heat.

A non-combustible filter frame for the all-glass fiber filter is being developed commercially (Fig. 9). The filter made of asbestos fibers and glass fibers is also approaching commercial availability. Industrial installations, hospitals and research laboratories which require removal of biological, radiological or other particulates from an air stream, now have access to a highly effective, fire and chemical resistant (except for hydrogen fluoride and alkalies) filter. Frequently, such a filtration system may be used in lieu of a costly incinerator.

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JOURNAL SECTION

Effects of Air Conditioning on Plant Growth†

By F. W. Went*, Pasadena, Calif.

This paper is the result of research sponsored by THE AMERICAN SOCIETY OF HEATING AND VENTILATING ENGINEERS in cooperation with the Earhart Plant Research Laboratory of the California Institute of Technology

ONE OF THE most neglected aspects of the cultivation of plants is the control of their environment. Horticulturalists carefully select plants for high productivity and disease resistance; control pests and diseases; use elaborate machinery to prepare the soil, to plant and to harvest; fertilize and irrigate whenever accurate determinations and field experiments indicate the need: but nothing is done about the weather. Yet, of all factors influencing plant performance and crop yield, light intensity and duration, temperature and wind are of the greatest importance.

SUMMARY — The factors which influence plant performance and crop yield are principally light intensity and duration, temperature and wind. The only method used extensively to modify the aerial surroundings of plants is to grow them in greenhouses.

The effects of relative humidity, wind velocity, light intensity and temperature were determined in the laboratory, and from the results obtained conclusions were drawn regarding the possibility of increasing production of food by providing the proper conditions surrounding the plants.

The possible effects of laboratory tests upon future greenhouse construction are indicated.

Greenhouses and Their Development

The only method employed extensively to modify plant environment is the use of greenhouses. Logically speaking, it would be expected that modification of the greenhouse atmosphere would be accomplished by air conditioning, but for several reasons this is not the case: (1) Greenhouses are much older than air conditioning; for centuries they were operated without its benefits and the common human trait of conservatism has delayed the general application of air conditioning to greenhouses. (2) Air conditioning has been developed and has been considered mainly with human and industrial needs in mind. (3) A few simple but important modifications to the general practices of air conditioning have to be made before it is applicable to the growing of plants.

Basically, greenhouses were developed in cold climates like those of England and the Netherlands, to make it possible to grow plants, such as orchids, native to warmer climates. Later they were used to produce summer flowers and fruits out of season. This meant compliance with the following principles: (1) exclusion of frost during winter; (2) exposure to sufficient light to allow photosynthesis; (3) heating of the air whenever the outside temperature is too low for normal growth; and (4) ventilation to allow entrance of CO_2 and to cool the greenhouse whenever too much heat

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†This research work has been carried on under the guidance of the ASHVE Technical Advisory Committee on Plant and Animal Husbandry: A. J. Hess, chairman; A. B. Algren, H. A. Borthwick, Samuel Brody, John Everetts, Jr., F. G. Gustafson, S. R. Lewis, H. A. Lockhart, H. H. Mitchell, K. V. Thimann, W. G. Whaley, R. B. Withrow, H. E. Ziel.

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from the sun's radiation is trapped under the glass cover.

In the so-called conservatories in use in the 17th century, which were nothing but large rooms with French windows, the heating requirement was satisfied by simple convection of the heat from a stove, placed near the plants. This sufficed to keep them frost-free, but with the development of glass-covered greenhouses considerably more heat and a more efficient means of heat distribution were required. This was first done with long smoke-channels, but in the last 100 years hot water or steam pipes, judiciously distributed through the greenhouse, solved the heating problem.

For cooling, ventilation windows in the eaves of the greenhouse roof were installed, and in some cases acceptable ventilation was achieved by adding side ventilators. The operation of the ventilators is purely manual, and although they do not permit precise control over the greenhouse temperature, they can restrict the rise in temperature at midday. Many growers, however, are loath to open the side ventilators, as insects and infections may enter along with the cooling air.

With the development of air conditioning it was obvious that this could provide the means of controlling the greenhouse atmosphere within the limits required by plants for best performance. The possibilities of air conditioning widen the usefulness of greenhouses tremendously. The usual heating systems provide only for raising the temperature of the houses above that of their surroundings. Conventional greenhouses therefore, are properly called hothouses, and are useful only during cool and cold weather, and then only for plants requiring temperatures higher than those outside. In many parts of the United States, summer greenhouse temperatures may rise to values surpassing the tolerance of many plants, and thus ordinary unventilated greenhouses are effective only approximately 60 percent of the year. This suggests that any means by which greenhouse temperatures can be kept below the tolerance limits of greenhouse crops during the summer will increase the usefulness of greenhouses in the United States.

Before discussing the specifications for air conditioning systems of greenhouses, the exact conditions which are to be maintained should be established, *i. e.*, the optimal growing conditions for plants should be determined. To do this, previously existing knowledge cannot be used as there is little published information concerning the investigation of plant growth under reasonably controlled conditions. For such investigations it is essential to have completely air conditioned greenhouses, and to utilize artificial light. Only by maintaining a particular set of conditions for a sufficient period of time can the response of plants to the conditions be established. Short term experiments are inadequate in this respect, as the work of Blaauw* at the Agricultural College in Holland has proved. He found that in addition to the immediate effects of temperature on the development and flowering of tulips, hyacinths and other bulbs, there were delayed effects, which did not show themselves until many months later. Also, effects of light can become visible only weeks or months after exposure.

When, for example, strawberry plants are subjected to two weeks of short days and long nights, the first signs of increased flowering will appear two months later. Therefore, it is almost impossible to deduce the optimal growing conditions for plants from their behavior in the field. For instance, it cannot be said that the high sugar content of sugar beets is due to the high temperatures in July, or the rains in June, or the strong light in August, or the cold nights in September; each of these factors may have had an immediate or a delayed effect; which can be unravelled only by patient research wherein each of these factors is controlled and applied at specified times.

Control of Climatological Factors

Before specific recommendations can be made for the construction of commercial air conditioned greenhouses, a set of such greenhouses must be available, in which all climatological factors can be controlled, and in which each factor can be treated as a variable. This was acquired for the first time in the Earhart Plant Research Laboratory (see Fig. 1). With its 20 separate air conditioners a total of 46 different conditions of temperature, humidity, wind, gas content of the air and light are maintained simultaneously. Actually, at any one time plants are subjected to several hundred different climates, since they are being moved between the 46 conditions, either for a short time or regularly. Thus, any of the 10 different day temperatures can be combined with nine different night temperatures, either to give the large day-to-night fluctuations of dry regions or the small daily temperature range of oceanic climates, or even to reverse the normal conditions of higher day than night temperatures. In this way it was discovered that African Violets (Saintpaulia) grow best at a day temperature of 55 F and a night temperature of 75 F. This behavior, however, is an exception; all other plants investigated thus far do best when the day temperature exceeds that of the night.

For purposes of interpretation of results, most experiments on the effects of temperature fluctuations have been carried out with a constant temperature during the light period and another constant temperature during the dark period. This is also theoretically justified, since in light and darkness, different processes, each with their own optimal temperature, predominate. In special experiments it was found that when plants are subjected to several different temperatures during either the dark or the light period, the plant behaves as if it had been grown at the arith-

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*See: Thermoperiodicity, by F. W. Went (reprinted from *Vernalization and Photoperiodism* — a Symposium, Vol. 1, Edited by Frans Verdoorn, The Chronica Botanica Co., Waltham, Mass., 1948).

metical mean temperature, provided the difference in temperature did not exceed 10 deg. With bigger temperature fluctuations growth was less than expected on the basis of the average temperature. The problem of finding the optimal growing conditions for any plant is further complicated by the fact that each plant has its own optimal day and night temperatures and light requirement. Therefore, each species and variety of plant has to be investigated individually. As research progresses, however, certain similarities can be noted, *e.g.*, tomatoes, potatoes and chili peppers respond mostly to variations in night temperature, while peas and strawberries are particularly sensitive to day temperatures. On the other hand, the development of peaches and false hellebore depends entirely on a sufficiently long cold period.

The most extensive work on a particular plant in the Earhart Laboratory has been carried out with tomatoes. They are one of the most important greenhouse crops, and therefore our results have direct practical applicability. From a physiological standpoint the tomato is also a desirable plant, because it does not store food and thus responds within one or two days to a change in climate. Furthermore the tomato is very sensitive to climate, and the big differences in yield from year to year are largely attributable to differences in climate.

Effects of Individual Climatic Factors

Relative Humidity: First a study was made of the effects of the individual climatic factors on the growth and fruiting of the tomato plant. Relative humidity of the air is practically without effect; at 25 percent relative humidity, growth is normal and identical with growth at 80 percent RH (tested at 80 F dry bulb temperature). This is true only when the plants have developed a large root system and are watered regularly.

Wind Velocities: At wind velocities of 5 mph (440 fpm) at plant level, growth is rather strongly inhibited; above 10 miles per hour severe damage to the plants occurs and they die within a few days. Plants kept at wind velocities of 250 fpm at low (250 ft-c) light intensities are sturdier than those grown in relatively calm air at the same light intensity, but it is impossible to say whether this is an effect of air movement or temperature. However, at lower velocities, such as occur in the air conditioned greenhouses (20-50 fpm), growth is optimal. At still lower velocities (10 fpm or less) growth is reduced again. This is at least partly due to starvation, when the amount of CO_2 within diffusion distance from the stomata becomes limiting. This is a rather important point, for it indicates the degree of air movement necessary in a greenhouse. On dark days lower velocities may be permissible, but any tomato greenhouse should be devised so as to give, during daytime, a minimal rate of air flow past the leaves of 20 fpm. When the greenhouse remains tightly closed (*e.g.*, in freezing weather) an internal source of CO_2 should be provided. If burners could be devised which would burn fuel so completely that no toxic partial oxidation products escape into the air, open burners in the air stream of the supply duct would be ideal, because of the 100 percent heat transfer and the CO_2 supply. In the absence of such open burners the CO_2 supply has to come from the organic matter (manure, bean straw, or corn husks) which is slowly decomposed on or in the soil.

Light Intensity: Light intensity is of great importance in the growth of the tomato plant. A tomato leaf is saturated with light at approximately 1000 ft-c. This value fluctuates somewhat according to the rate at which the plant uses its photosynthates in top, root, and fruit growth, and to the temperature. At low temperatures, leaves are light-saturated at a lower light intensity and therefore greenhouse temperatures should be kept lower on dark days. In non-air conditioned greenhouses this is automatically the case; in air conditioned houses provisions for such temperature adjustments according to light intensity have to be made.

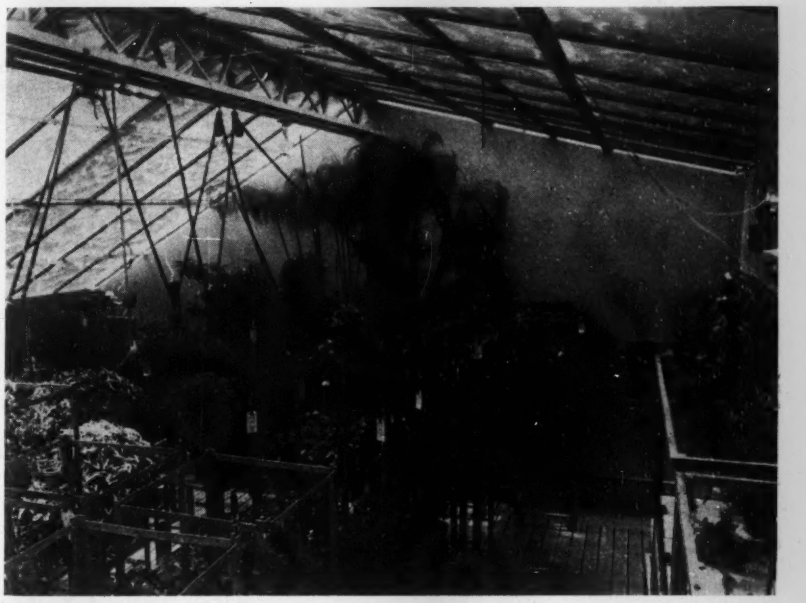


Fig. 1—Interior view of one of the rooms showing air inlet slots in floor, exhaust registers on wall and water flowing over the glass roof. Strawberry plants are mounted on wheeled trucks. Tubes suspended from center carry nutrient solution and deionized water

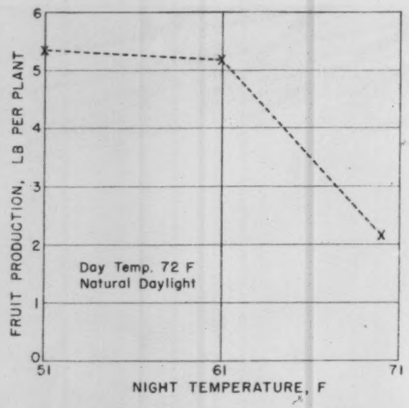


Fig. 2—Relationship between night temperature and total fruit production of the Ailsa Craig tomato

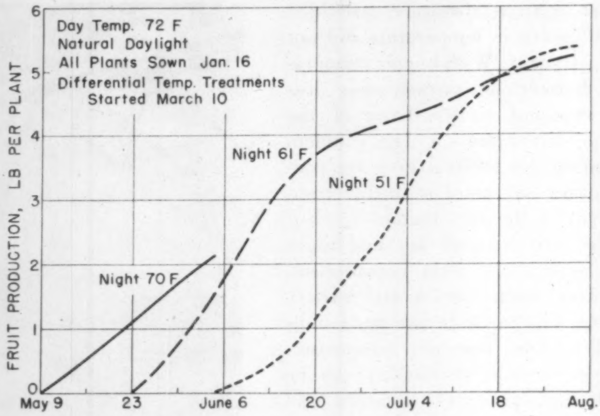


Fig. 3—Relationship between night temperature, total fruit production, and ripening time for the Ailsa Craig tomato

Since a mature plant has leaves over a long stretch of stem, they shade each other, and to have the lower leaves receive a sufficient amount of light, the light intensity in the greenhouse should be several times the saturating intensity for the individual leaf. In general it seems that light saturation for the whole plant occurs only at nearly full sunlight. It is very likely that by losing its older leaves the tomato plant automatically adjusts itself to the prevailing light intensity, but production will always be lower with fewer leaves. When grown in a light intensity at 1500 ft-c, practically no fruit production occurs in an 8-hr daily photoperiod. With 16 hours of light per day, optimal fruit production occurs in this low light intensity at a day temperature of 55 F and a night temperature of 60 F (for the Ailsa Craig variety). In full daylight the optimal day temperature is 73 F and the optimal night temperature 60 F.

Whereas the length of daily illumination is of importance when the light intensity is low, it becomes of less and less consequence at higher light intensities. Therefore in summer, growth and fruit production in the tomato is not limited by light, but in winter it definitely is. Experiments are now under way to find to what extent sugar applications can substitute for this light requirement during winter.

Influence of Day and Night Temperatures

Night Temperatures: The most important environmental factor in the growth and fruiting of tomato plants is the night (or dark) temperature. Unless this is kept for a sufficiently long time (about 8 hr) nightly for 5-10 days within a rather narrow range, none or few fruits develop, irrespective of all other conditions. This range varies somewhat with varieties and changes with the age of the plants, but as a typical example the behavior of the Ailsa Craig variety will be described. Closely resembling this variety in behavior are Michigan State, Tuckqueen and Essex Wonder. These are all greenhouse varieties, which will produce fruit at light intensities which would be insufficient for field varieties. They also have a slightly lower optimal night temperature than field varieties like Stone, Pearson, Rutgers, etc.

Germination and Transplanting Temperatures: The seeds of tomatoes germinate best at 80 F. When the seedlings are above ground, their fastest growth during the first week is still at nycto-temperatures around 80 F, and then in the course of the next 2 or 3 months, this optimal night temperature decreases gradually to 60 F. This is one, and perhaps the most important, reason why tomatoes are always transplanted. A greenhouse would have to be kept very warm for the first month to get good seedling growth. A small section, when kept for seedlings only, can be kept at a higher temperature. Usually the plants are transplanted from seedling flats into their permanent location in the greenhouse, when they are 4 to 8 in. high. If they could be transplanted in a later stage, when they have reached a height of 3 ft, a considerable fuel saving could be effected. Such later transplanting is now feasible, if the plants have been sprayed with a 10 percent sugar solution 1 to 3 days prior to transplanting.

Ripening of Tomatoes: Fig. 2 shows the relationship between night temperature and total production in the Ailsa Craig variety. The plants were pruned back to a single stem, and all were topped above the fifth inflorescence. Therefore, production per plant could have been higher if they had not been topped. However, the plants had to be moved from one greenhouse to another to obtain the different day-and-night temperature combinations, and thus growth had to be curtailed when the plants became higher than the doors through which they had to pass. This figure does not show the progress of ripening, which was much faster at the higher temperatures. Since earliness of production is an important factor in greenhouse tomato production, Fig. 3 shows the total weight of fruits harvested as a function of time. It has to be realized that this production was obtained in spring and summer under very favorable light conditions.

Day Temperature: Day temperature is much more important in tomato production than had been realized in earlier experiments. A marked optimum occurs at 73 F; at temperatures both higher and lower, production is substantially less. This makes an excellent argument for air conditioning of greenhouses. Whereas night temperatures can be sufficiently controlled by old-fashioned heating devices, day temperatures can be controlled effectively only by air conditioning. It is obvious that higher temperatures per se are not injurious, and therefore temporary rises in temperature inside the greenhouse are tolerated. In most areas wet bulb temperatures are such that with an air change 60-100 times per hr evaporative cooling suffices to keep greenhouse temperatures down to 75 F most of the time; occasional rises to 85 F will occur but are not likely to cause damage. With such a rate of air change, no white-washing of the greenhouse roof is necessary, and thus full advantage can be taken of all sunlight.

Influence of Precipitation

A few preliminary tests have been carried out to find whether rain influences tomato growth. It turned out that daily sprinkling of the leaves with water (to simulate rain) would decrease their growth in comparison with plants watered only through the soil. This indicates that the proper way of watering in a tomato greenhouse is through subirrigation.

Economics of Air Conditioning

The question as to whether air conditioning can be economically justified in tomato growing can be answered with the following facts in mind. In ordinary greenhouses in England and the Netherlands a production of 40 to 50 tons of fruit per acre is normal. When extra care is taken in all growing operations, such as pest and disease control, fertilizing, and watering, production has been pushed to 80 to 90 tons per acre (at Plant Protection, Ltd., Fernhurst, England, G. Locke in charge). From the production figures under controlled temperatures it can now be calculated that 160 tons per acre should be attainable. Therefore, it seems as if air conditioning by itself can double production of tomatoes. With local prices, construction and labor costs, and the costs of utilities, it is possible to calculate whether the cost of air conditioning can be amortized out of increased income. These conditions will vary in different parts of the United States, since in some areas competition with outdoor tomatoes will become an important factor earlier in the year, which means abandoning the greenhouse crop earlier, and thus, in practice, the total production per acre in an air conditioned greenhouse will be less.

Methods of Obtaining Optimal Conditions

The amount of solar radiation which reaches the inside of the greenhouse on a clear summer day is very great. This radiation is transformed into (1) heat of evaporation, (2) chemical energy, and (3) sensible heat. Process 2 (photosynthesis) does not amount to more than about 2 percent of the total radiation. Process 1 will vary much from crop to crop, but might tentatively be set at 48 percent of the radiation. This leaves another 50 percent which has to be removed largely by an air stream. When the heat radiation above 14,000 Angstrom units is removed by a water layer over the roof, then the discharge air will still be about 8 deg warmer than the incoming air at a rate of air change of 120 times per hr.

Therefore, to exert any control over the greenhouse temperature by air conditioning, the air in the enclosure has to be changed at a rate of at least 60 times per hr. This air has to move past all plant surfaces; in dead air spaces temperature will rise uncontrolled. However, the same rapid air stream is also required to supply the CO_2. Therefore, both for temperature control and for CO_2 supply a rapid air change is required.

When greenhouses are fully air conditioned, all incoming air can be filtered. This *can* eliminate not only all insects which might infest the plants, but also all smog and other toxic air-pollutants. Whereas insect-proofing of greenhouses has not been considered very much, it is quite feasible, and may be of sufficient economic value to justify it commercially.

The problem of how to introduce and circulate such large volumes of air in a greenhouse without causing air currents of excessive speed will require additional study. In the Earhart Laboratory it is solved by introducing the air through slots in the floor from a plenum just below the floor. This has worked very well, but is rather expensive, and excludes the possibility of solid benches. This may be a blessing in disguise because the solid benches in most greenhouses prevent proper air circulation between the plants causing unwanted temperature differentials and uneven growth. The greater height of plants frequently observed in the center of a solid bench is due to reduced circulation and higher temperatures.

Temperature Control: Temperature control in the large air conditioned greenhouses is achieved by passing the incoming air through a spray-chamber, which controls the wet bulb temperature. The spray-water temperature is regulated by a preheater in the air-stream or by injection of chilled water into the spray-nozzles. The airstream passes through reheating coils to heat the air to the required dry bulb temperature. In practice, most of the reheating is done by radiation from the sun. In the smaller air conditioned artificial light rooms, the temperature is entirely controlled by passage through two successive coils, one a heating and one a cooling coil. Pneumatically operated, modulating type controls are used throughout, and have proved entirely satisfactory.

F. PAUL ANDERSON AWARD

The Committee of Award for the F. Paul Anderson Medal announces that nominations for the F. Paul Anderson Medal for 1954 are invited. Any member of the Society is eligible for nomination. The award is made in recognition of work done or service performed in the field of heating, ventilating or air conditioning.

Nominations, together with a full statement of the candidates' qualifications and achievements, should be sent to the Committee at ASHVE Headquarters, 62 Worth St., New York 13, N.Y., prior to August 1, 1954.

F. Paul Anderson Committee
J. E. Haines, *Chairman*
Lester T. Avery L. E. Seeley
S. R. Lewis B. M. Woods

In the latter rooms, humidity control is possible only through water-atomizers. Only in one room can a liquid absorption type dehumidifying unit control the humidity over a very wide range.

Recirculated and Fresh Air: In each system, the amount of fresh air *vs.* recirculated air can be regulated either manually or automatically. In addition to what has been said about tomatoes, two more examples will be given in which air conditioning of greenhouses may prove of economic significance. Further research in the Earhart Laboratory will undoubtedly contribute many more facts of importance in the construction of greenhouses. This is significant if greenhouses are to be made more efficient by air conditioning. The growth of orchids is very sensitive to temperature fluctuations. By air conditioning, the proper day and night temperatures can be maintained indefinitely and thus much faster and better growth is possible. In this way, for instance, Cypripediums and Phalaenopsis can be grown very successfully, using artificial light.

By proper regulation of the environment not only the growth of strawberry plants, but also the flavor of the fruit can be controlled. To get sweet strawberries, plants must be subjected to high light intensities, such as are obtainable with daylight. For their sugar production, the temperature during light exposure is rather unimportant. The typical strawberry aroma, on the other hand, develops only when the plants are subjected to light at a fairly low temperature (between 50 and 60 F). By air conditioning, it would be possible to cool greenhouses sufficiently during the night, so that the proper aroma would be produced when the plants are given artificial light during the night period.

Conclusions

Air conditioned greenhouses are essential for the investigation of plant behavior in relation to their environment. Only by such means can the effects of climate on crop plants be measured, and with the results obtained it may be possible to improve the growing conditions of many agricultural crops. Improvement might be made not only in crops which are occasionally grown in greenhouses (like tomatoes) but methods may be developed thereby, which would indicate those field conditions that might be modified so as to increase production or quality.

Several examples of the effects of controlled temperature and light duration on tomatoes, strawberries and other plants have been discussed. In the case of the tomato it was shown that under ideal growing conditions obtainable with air conditioning a doubling of fruit production in the greenhouse is possible.

The most important factors which have to be considered in the construction of air conditioned greenhouses have been discussed.

DISCUSSION

A. J. Hess, Los Angeles, Calif.: It will be noted that the cooling water for the air conditioning system flows over the roof, thereby acting as a radiation shield. The roof acts as a cooling tower for the system.

Three air changes per minute were required, and because of the large volume of air supplied it was necessary to give special attention to air diffusion. The air was introduced successfully through a slotted floor.

It seems to me that as time goes on one of the principal uses for greenhouses will be for study of the problem concerning solar energy. While the storage of solar energy by means of plants may be inefficient, it should be remembered that plants store the energy over a relatively long period of time, and thus tend to equalize the storage regardless of the variations due to clouds, darkness or season.

Plants can be used as a means of transferring solar energy. They can be grown where solar energy is abundant, converted to chemical energy, and transported to regions having less solar energy.

B. P. Fisher, Houston, Tex.: I wish to inquire why the author has not used carbon dioxide produced by the burning of natural gas which is so abundant. An excess amount of water vapor would be produced by combustion of the gas, but could readily be eliminated if necessary.

Author's Closure: Referring to Mr. Fisher's suggestion, we have not used combustion of natural gas to produce carbon dioxide because some toxic materials might have been produced. It would seem ideal to burn gas within the duct supplying air as there would then be no heat transfer problem in disposing of the heat generated.

In our greenhouse air conditioning system the carbon filters make it possible to remove about 95 percent of the smog from Los Angeles air. The smog problem occurs in all large cities and affects animals and human beings, as well as vegetation. It is of interest that our plant research in a greenhouse should emphasize the need for removing smog from air breathed by humans and animals.

AIR CONDITIONING AT HIGHEST LEVEL

From small bungalow to large skyscraper, air conditioning is the mainstay of human comfort. Ground breaking will begin in a short time for the new 42-story Socony-Vacuum Building at 150 East 42nd St., New York, N.Y. This will be one of the largest air-conditioned office buildings ever erected.

The contract for construction represents one of the largest steel orders for an individual commercial structure placed in the last 25 years.

ASHVE Research Objectives

Dear Members:

Most of our professional societies serve the very useful purpose of educating their members. This is done by presenting a collection of engineering information and scientific data to the profession at meetings and in publications.

ASHVE obtains not only advanced engineering data and research material, and makes them available to us in useful form, but, through its research program, basic principles and fundamental data are discovered and developed.

Our Society has been initiating and stimulating research for many years. We availed ourselves of facilities provided by educational, governmental, and industrial institutions until 1919 when we established our own Laboratory at the U. S. Bureau of Mines in Pittsburgh. In 1944, we moved to limited quarters in Cleveland, Ohio, and in 1946, we acquired our present quarters at 7218 Euclid Avenue.

The cost of the present Laboratory, $70,000.00 has all been paid. Its buildings, currently appraised for insurance purposes at $201,000.00, have contents valued at $104,000.00.

We mentioned in our letter to the membership last month, that as an educational and scientific institution, we are dedicated to advancing the arts and sciences of heating, ventilating and air conditioning, and their allied arts and sciences, for the benefit of the general public. Our Society's research is devoted to the public welfare alone. It cannot promote any individual, private, or commercial interest.

The specific objective of our research is to conduct and coordinate fundamental and basic research; also to determine technical principles and laws in sciences relating to our own and allied professions. We are the only professional engineering organization that maintains and operates its own Research Laboratory with a full-time director and staff.

The men who conceived our Society research procedures displayed admirable foresight in limiting our research to the basic and fundamental. We do not engage in commercial testing, or in the development or approval of products.

Through our program of basic research we discover many things the industry must do to provide more human comfort, public health, and safety, while improving production. Without adequate heating and cooling equipment, the general welfare of the public, in most climates, would suffer greatly.

Our industry ranks in importance and necessity with the food and clothing industries.

Anything that we can do to discover better engineering techniques and advance principles for the design and application of equipment used in our industry is of public benefit. To create a better understanding of human needs and learn how to provide them is our goal and duty. Educating and informing our profession and industry of these requirements puts them in a better position to serve the public.

Principal research in this industry is carried on by manufacturers; segments of the industry or groups, such as trade associations, and THE AMERICAN SOCIETY OF HEATING AND VENTILATING ENGINEERS. The research by manufacturers is limited almost exclusively to the application and development of new products. Only a few do basic or fundamental research.

Research by some of our trade associations has been both commendable and productive; however, its usually limited scope is of primary interest only to the group involved. Some of the organizations publish their findings through ASHVE.

ASHVE provides an organization through which we can all pool our resources for the support of basic research of interest to the entire industry. Through it, we can obtain the cooperation of manufacturers, contractors, engineers, government agencies, educational institutions, foundations, commercial research organizations, and others. It has established a record of integrity and lack of bias or prejudice. Through it we obtain advice, cooperation and guidance of the many experts in our profession.

In 1954, we will spend about $175,000 on research. To operate our research program on a more efficient basis, we should have a minimum expenditure of $250,000 per year, preferably more. We are now making plans for an expanded research program. **If industry would contribute one one-hundredth of one percent (0.01%) of its gross sales toward the support of a basic research program we could accomplish much.**

No prospective contributor to our research can justifiably say that there is nothing of specific interest to him in our program. A few of our projects are in specialized fields but most of the program affects everyone in the industry, regardless of how limited the individual's interests may be.

The Society has a commendable record of accomplishments in its research. Engineering design and installation practice would not now be so far advanced were it not for Society research. Every day we unconsciously use the results of Society research. If we were suddenly deprived of these results, we would find an immense void in the technical information available to us.

Research has little value if its findings remain only in the minds of the investigators. One of the Society's responsibilities is the translation and transmission of what is learned by the advanced investigator into the minds of those who will apply this information for public benefit. This problem will be discussed in a future letter.

Cordially yours,

L. N. HUNTER, President

JOURNAL SECTION

Operation Research ASHVE

IT is evident from letters received at the Research Laboratory that many members of the Society are unfamiliar with its research program. The purpose of this report is to acquaint those members, and the industry in general, with this important ASHVE activity.

Organization

THE AMERICAN SOCIETY OF HEATING AND VENTILATING ENGINEERS is unique among the country's engineering societies in that it maintains an organization engaged solely in research. Its program is conducted by the Committee on Research, which is, in turn, subject to the direction of the Council. This Committee consists of 15 members, one third of whom are elected each year for a three-year term.

The Chairman of the Committee on Research appoints Technical Advisory Committees to assist in handling the many details of the research program. At the present time, there are 20 of these Advisory Committees, each of which surveys the need for, and exercises guidance in, the research in a particular field. New Technical Advisory Committees can be appointed, and existing ones dismissed, by the Chairman, as he finds it necessary to meet changing research interests of the Society and the industry.

Actual direction of the research program is the duty of the Director of Research, who is appointed by the Council, on recommendation of the Committee on Research.

Location of Society Research

The ASHVE Research Laboratory is in Cleveland, Ohio, and serves as headquarters for Society research operations. It is well-staffed and equipped, and provides ample space for effective research. Most of the work at the Laboratory has been in the general fields of heat transfer and fluid flow, since it is in these two areas that most of the industry's problems arise.

In addition to the work done at its Laboratory, ASHVE research is also carried on at a number of educational institutions throughout the country. During 1953, work was done on 16 projects at 14 colleges and universities. In some cases, these projects are carried on under a cooperative contract with the institution, while in others, ASHVE Research Fellowships are established. Financial contributions made by the Society to cooperating institutions vary considerably, depending upon the requirements of the various projects.

There is no particular division of research done at the Society Laboratory and at cooperating institutions. In general, projects which will require extensive construction of specialized equipment are done at the Laboratory. If, on the other hand, a school already has equipment suitable for a certain project, and men trained in its use, it is usually advantageous to set up a cooperative project with the institution.

Type of Research Done

Under its By-Laws, the Society can engage only in research of a fundamental nature to develop basic data of general interest relating to the arts of heating, ventilating, cooling, and air conditioning. It is not permitted to test proprietary equipment or to engage in commercial testing of any kind.

Research Funds

There are three general sources of funds for Society research. The first is the Society membership as, under the By-Laws, 40 percent of the dues of Members, Associate Members, and Affiliates are allocated to research.

The second source is the *International Heating, Ventilating and Air Conditioning Exposition,* which is held every other year at the time of the Annual Meeting of the Society.

Contributions from industry constitute a third source of research income. That the research conducted by the Society is of direct benefit to the heating and air conditioning industry is shown by the sizeable contributions to the research fund that have been made by many companies over a period of years.

Industry contributions may take either of two forms. If a company is primarily interested in one particular project, its contribution may be earmarked for, and will be spent on, that project. Other companies which have a general interest in all of the Society research make general contributions, which may be spent on any part of the program.

During the last few years, the Research Laboratory has engaged in the design and construction of a human calorimeter for the Office of Naval Research. This was a fourth source of research income. Under the contract with the ONR, the Society was reimbursed for all expenditures for equipment, supplies and labor used on the calorimeter, and in addition, the ONR paid its proportionate share of the Laboratory overhead.

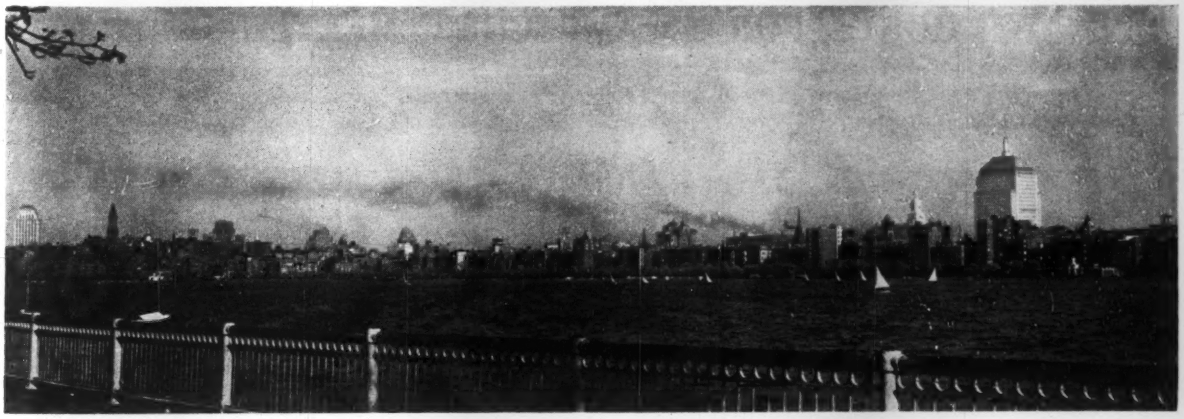
A breakdown of the research income for 1953 is given in the Auditor's Report, published in the March 1954 JOURNAL SECTION of *Heating, Piping & Air Conditioning.*

Initiation of Research Projects

Research projects can originate in a number of ways. Suggestions for research may come from a TA Committee, from a University Laboratory, or they may come from an individual member of the Society.

Suggested research projects, regardless of source, must first be considered by the TA Committee covering the particular field of interest. If this Committee favors the project, it recommends it to the Committee on Research for consideration. If the Committee on Research agrees with the TA Committee on the merits of the project, and if funds are available, the project is referred to the Director of Research for activation.

There are always more projects recommended to the Committee on Research by the TA Committees than can be activated within the limitations of the research budget. The Committee on Research is, therefore, faced with the problem of deciding which of the recommended projects should have priority.



Boston Skyline as seen from Cambridge looking across the Charles River

Attend the 1954 Semi-Annual Meeting and Nudge History at Every Turn

IF YOU HAVE a keen eye for spotting epitaphs on tombstones over the graves of the great; if you get a kick out of culture; if you crave expertly cooked sea food — then you MUST attend the Semi-Annual Meeting of THE AMERICAN SOCIETY OF HEATING AND VENTILATING ENGINEERS, June 28-30, 1954, in Swampscott, Mass., where artists come to paint a *stern and rockbound coast,* 11 miles north of Boston, oldest large city in the United States.

Colonial Governor John Winthrop, Cotton Mather, and two Presidents, John Adams and John Quincy Adams, are buried in cemeteries of this area. This is the home of many art galleries, musical conservatories, museums, the Boston Symphony Orchestra, of world-wide acclaim, and schools like Harvard, Wellesley, and Massachusetts Institute of Technology. The country's largest fish-shipping port, it offers the best of the catch, prepared according to old-fashioned Yankee recipes, to sea food lovers.

R. T. Kern, general chairman, A. L. Hare, vice chairman, and Dean L. E. Seeley, honorary chairman, the Committee on Arrangements, are untiring in their efforts to make this the best summer meeting of the Society. They have prepared an agenda that includes technical information and research data pertinent to the profession and industry, and the opportunity to obtain an eyeful of history.

THEY THAT GO DOWN TO THE SEA IN SHIPS
1623 - 1923

Fishermen's Permanent Memorial at Gloucester

Among subjects for discussion, the Program and Papers Committee, headed by Prof. B. H. Spurlock, Jr., Boulder, has included physical responses to environment, air filtration, solar radiation studies, operational cost of residential cooling systems, relation of room size and panel area, studies of vertical jets for hot and cold air, downward throw of heated jets, and noise in piping systems.

The Entertainment Committee has arranged sightseeing trips over this section, once the hotbed of the American Revolution, highlighted by visits to the old homes, scenes of activity, and graves of the rugged men who spearheaded the Revolution.

Golf Tournament

L. R. Geissenhainer, Entertainment Committee chairman, has announced completed plans for the Annual Golf Tournament, Monday afternoon, June 28, which features competition for the Research Cup. The Chapter teams will compete for the Eichberg Memorial Trophy. The Paul Bunyan Cup will be the award of the member having high gross.

HOSTS FOR SWAMPSCOTT MEETING

A. L. Hare

R. T. Kern

L. E. Seeley

W. G. Burbo

John Bonner

L. R. Geissenhainer

Committee on Arrangements

R. T. Kern, *General Chairman*

A. L. Hare, *Vice Chairman* L. E. Seeley, *Honorary Chairman*

Banquet: G. D. Fife, *Chairman;* E. L. Blair, R. E. Reid, F. C. Williams.

Entertainment: L. R. Geissenhainer, *Chairman;* M. I. Kishler, W. H. Krapohl.

Finance: W. H. Shipp, *Chairman;* W. J. Ahearn, R. F. Curry, G. E. MacNeill, G. E. Roberts, Jr., D. J. Stressenger, H. L. Von Rehberg.

Ladies: D. M. Archer, *Chairman;* John Bonner, L. V. Richards, L. E. Seeley, R. G. Vanderweil.

Publicity: J. MacG. Means, *Chairman;* A. I. Brayman.

Sports: W. C. Burbo, *Chairman;* R. C. Berry, W. G. Martin, Jr., F. W. Thorley.

Reception: G. W. Sprague, *Chairman;* J. W. Brinton, J. H. Colby, A. A. Fava, G. E. Fickett, H. L. Flanagan, M. I. Kishler, C. W. Larson, F. A. Merrill, H. E. Parker, E. M. Tracey, W. A. Williams.

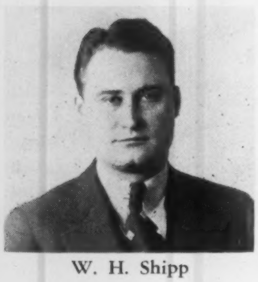
Sessions: John Bonner, *Chairman;* J. N. Gates, J. P. Hoar, J. A. Ivester, A. L. Nelson, J. M. Pettingell, B. H. Snow, R. B. Stevens, R. J. Tesar, R. G. Vanderweil.

Transportation: H. L. Farrow, *Chairman;* W. F. Austin, I. S. Dane.

D. M. Archer

H. L. Farrow

G. W. Sprague


W. H. Shipp

J. MacG. Means

G. D. Fife

Free-Hour Time

During the hours when committee meetings are over and minds are free of thoughts on cooling a house during a Texas summer, how to store the sun's heat, and directional characteristics of radiant panels, pleasant diversions are planned for members and guests. These include an all-day boat trip to famous Cape Cod, a visit to the Port of Gloucester, where men *go down to the sea in ships*, and an *Engineers' Night* at the hit sensation that started in 1885, the Boston *Pops*

PROGRAM — 1954 SEMI-ANNUAL MEETING

THE AMERICAN SOCIETY OF HEATING AND VENTILATING ENGINEERS

New Ocean House, Swampscott, Mass.
June 28-30, 1954

Saturday — June 26

- 10:00 a.m. Council Meeting

Sunday — June 27

- 9:00 a.m. REGISTRATION *(Lobby Floor)*
- 9:00 a.m. Buses leave for Rowe's Wharf, Boston. Boat for Provincetown sails at 10:00 a.m. returning at 8:00 p.m. Picnic lunch furnished — refreshment facilities available on boat. Several hours in Provincetown for sight-seeing.
- 2:00 p.m. Musicale and Tea
- 2:00 p.m. Motor trips to nearby historical points

Monday — June 28

- 9:00 a.m. REGISTRATION *(Lobby Floor)*
- 9:30 a.m. FIRST TECHNICAL SESSION *(Ballroom)*
  - Physiological Responses to Sudden Changes in Atmospheric Environment: Studies of Normal Subjects, Obese, Hyperthyroid and Hypothyroid Patients, by Tohru Inouye, F. K. Hick, M.D., R. W. Keeton, M.D., and Lionel Bernstein, M.D.
  - A Rapid Heat Meter Thermal Conductivity Apparatus, by J. D. Verschoor and Ada Wilber
  - Irradiation of Vertical and Horizontal Surfaces by Diffuse Solar Radiation from Cloudless Skies, by G. V. Parmelee
- 12:15 p.m. WELCOME LUNCHEON *(Dining Room)*
  - Speaker: Edward Rowe Snow
- 1:30 p.m. GOLF TOURNAMENT *(Tedesco Country Club)*
  - Research, Eichberg and Paul Bunyan Cups — 18 Hole Medal Play
- 1:30 p.m. Deep Sea Fishing trip — Swimming at beach
- 2:00 p.m. Committee Meetings
- 7:30 p.m. Boston Pops Concert (popular and light classical music) Arthur Fiedler conducting

Tuesday — June 29

- 9:00 a.m. REGISTRATION *(Lobby Floor)*
- 9:30 a.m. SECOND TECHNICAL SESSION *(Ballroom)*
  - Characteristics of Downward Jets of Heated Air From a Vertical Discharge Unit Heater, by Linn Helander, S. M. Yen and L. B. Knee
  - Computing Temperatures and Velocities in Vertical Jets of Hot or Cold Air, by Alfred Koestel
  - Sound-Pressure Levels and Frequencies Produced by Flow of Water Through Pipe and Fittings, by W. L. Rogers
  - *Computation Charts and Theory for Rectangular and Circular Jets, by H. G. Elrod, Jr.
- 10:00 a.m. Ladies Party. Oriental Rugs, by Arthur Gregorian
- 1:30 p.m. Nominating Committee Meeting
- 1:30 p.m. Boat and Bus Trip to Salem and Gloucester
- 1:30 p.m. Historical Tour to Boston
- 2:00 p.m. Committee Meetings
- 2:00 p.m. Swimming at beach
- 6:00 p.m. New England Shore Dinner
- 8:30 p.m. Film presentation — informal dancing in the Ballroom

Wednesday — June 30

- 9:00 a.m. REGISTRATION *(Lobby Floor)*
- 9:30 a.m. THIRD TECHNICAL SESSION *(Ballroom)*
  - Filtration of Microorganisms from Air by Glass Fiber Media, by H. M. Decker, J. B. Harstad, F. J. Piper and M. E. Wilson
  - Effects of Room Size and Non-Uniformity of Panel Temperature on Panel Performance, by L. F. Schutrum and J. D. Vouris
  - Performance Data on Ceiling Panel Heating and Cooling, by R. J. Mindak and I. B. Fieldhouse
  - Cooling Load from Sunlit Glass and Wall, by C. O. Mackey and N. R. Gay
- 10:00 a.m. Ladies Visit to noted North Shore Gardens
- 2:00 p.m. FOURTH TECHNICAL SESSION *(Ballroom)*
  - Cooling Studies in a Research Home, by W. S. Harris and P. J. Waibler
  - Analogue Computer Analysis of Residential Cooling Loads, by T. N. Willcox, C. T. Oergel, S. G. Reque, C. M. toeLaer and W. R. Brisken
  - The Operating Cost of Residential Cooling Equipment, by S. F. Gilman, L. A. Hall and E. P. Palmatier
  - Adjournment
- 7:00 p.m. SEMI-ANNUAL BANQUET *(Main Dining Room)*
  - Toastmaster: Past Pres. Lauren E. Seeley
  - Speaker: Rev. Lex King Souter

New Ocean House Room Rates

(All rates shown include meals and are daily per person)

Double Room, twin beds and bath	$11.50, $12.00 and $12.50
Double Room, twin beds and bath *(Hotel Cottages)*	$11.25 and $11.50
Large Room, three beds and bath	$10.75 and $11.00
Large Room, four beds and bath	$10.25 and $10.50
Double Room, twin beds, and running water	$10.75 and $11.00
Suite, 2 double rooms, four beds and bath between	$11.00 and $12.00
Suite, 2 double rooms, five beds and bath between	$10.75
Suite, 2 double rooms, six beds and bath between	$10.25 and $10.50
Choice Corner or Bay-Window Room, twin beds and bath	$13.00 and $13.50
Single Room and bath *(Limited Number)*	$13.00, $14.00 and $15.00
Single Room and bath *(Hotel Cottages)*	$12.50 and $13.00
Single Room and running water *(Hotel Cottages)*	$12.00

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*Presented by title.

Concert. A special program is planned for children and teenagers.

Side Trips, Too

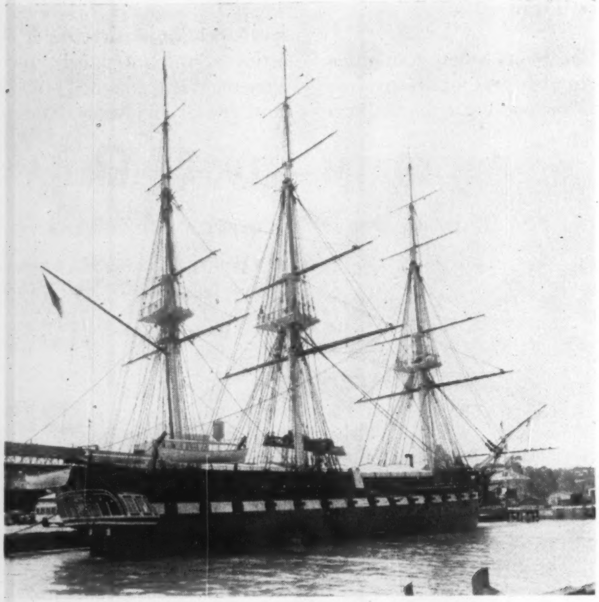
Swampscott's unique location on the North Shore of Massachusetts, adjacent to sites where the militant force for Liberty was manifested, offers opportunity for visits to noted spots. Tours by bus, train, or your own automobile, are easily arranged.

Following the route that Paul Revere rode, one can be in Concord or Lexington in less than a hour. Here are found the *rude Bridge that arched the flood* and the village green where the Minute Men stood their ground. A few miles north is Salem, the Witch City, reminder that although New England is now mellow, its religion was not always tolerant. The Old Witch Jail and Dungeon, built in 1684, and used as a jail during the witchcraft *epidemic*, is open every day. It contains a valuable collection of noted curios. Nearby is Witch House, where Judge Corwin lived and examined those suspected of knowing the Black Art. Of more pleasant note, in Salem, is the House of Seven Gables, made famous by Nathaniel Hawthorne. Only a half-hour away, overlooking the harbor, is Plymouth Rock, landing spot of the Pilgrim Fathers.

ASHVE members will be especially interested in billion-dollar Research Row, in nearby Cambridge. Impressive research laboratories, established and manned in cooperation with Harvard University, MIT, and other schools are fully equipped for the most extensive of research. They were prominent in war and are now geared for peace-time efforts.

History Comes To Life

When the technical sessions are ended, a pleasant way to clear the brain of multiple facts on daily radiation, perimeter loop, heat transfer coefficients, and environmental mean radiant temperature, is to see Boston's historical facts. They include Park Street Church, where on July 4, 1832, *America* was first publicly sung; Granary Burial Ground, where lie Paul Revere, Peter Faneuil, and Robert Paine; Faneuil Hall, the *Cradle of Liberty* the Patriots hired and the Cemetery of Poets where Henry Wadsworth Longfellow, James Russell Lowell, Oliver Wendell Holmes, Edward Everett, and Phillips Brooks are buried.



The U. S. Frigate Constitution, reverently known as "Old Ironsides"

The Fightin' Lady

Grownups, as well as children, will enjoy a visit to the Boston Navy Yard where the Frigate *Constitution*, reverently known as *Old Ironsides*, is moored. Built by Edmund Hartt and launched in 1789, the victor of 40 engagements has been rebuilt and restored to her former condition by contributions from the country's school children.

House Hunter's Delight

Boston is the place for house hunting — and you will want to see the oldest house there, built in 1660, home of Paul Revere; Old South Meeting House where protest meetings against forcing Massachusetts citizens into the English Navy were held; Custom House with its 490-ft high tower; the James Russell Lowell House, used as a hospital during the Battle of Bunker Hill; Jonathan Harrington House, home of the first Minute Man to be mortally wounded; the Wayside, the only house ever owned by Nathaniel Hawthorne, and the Antiquarian House, repository of early New England furniture, glass, china, brass, and fireplaces.

To Remember

No one attending the Semi-Annual Meeting should miss visiting Burial Hill on Massachusetts' South Shore. The noted Colonial Governor, William Bradford, is buried there. The obelisk to his memory is inscribed with words every American should remember, *Do not basely relinquish what the Fathers with difficulty attained.*

Swampscott is served by the Boston and Maine Railroad and Logan International Airport in Boston. Scenic routes beckon to those who plan on driving.

Members are urged to bring their families. As shown in the accompanying table, attractive rates prevail at the New Ocean House.

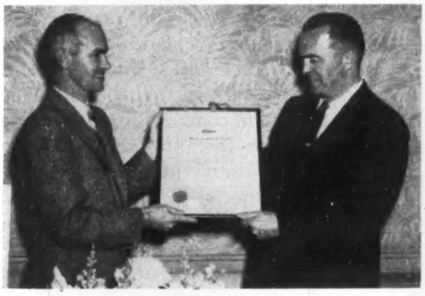
Reservation forms have been mailed to everyone in the Society, and applications for accommodations should be returned promptly. The Committee on Arrangements will appreciate early registration for the special events on the forms it will furnish.

SOUTH CAROLINA GRANTED CHARTER AS FIFTY-SIXTH CHAPTER OF ASHVE

THE AMERICAN SOCIETY OF HEATING AND VENTILATING ENGINEERS welcomed, with pride, into its family of Chapters, the newly chartered South Carolina Chapter, at an organization meeting in the Hotel Wade Hampton in Columbia, Monday evening, March 29. More than 70 members throughout the State gathered for the formal presentation of a Charter by ASHVE Pres. L. N. Hunter, Johnstown, Pa. This was the culmination of months of effort on the part of South Carolina members to establish a Chapter.

WELCOME
S.C. CHA
HEATING & VENTILATING
ENGINEERS HOTEL
WADE HAMPT

Dean R. L. Sumwalt, School of Engineering, University of South Carolina, gives welcoming address



ASHVE Pres. L. N. Hunter presents Charter to R. F. Donovan, president, South Carolina Chapter

SOCIETY
HEATING & VENTILATING
ENGINEERS HOTEL
WADE HAMPTC

South Carolina Chapter Officers (*l.* to *r.*) R. F. Donovan, president; J. E. McMurray, secretary; ASHVE Pres. L. N. Hunter and Executive Secretary, A. V. Hutchinson; Chapter Board of Governors, L. L. Hyatt, R. K. Rouse, M. R. Durlach, Jr.; and M. W. Rickenbaker, treasurer

Following a social hour and banquet, the business session was called to order at 7:45 by Chairman R. F. Donovan. He called on M. R. Durlach, Jr., to introduce Dean R. L. Sumwalt of the University of South Carolina, School of Engineering, who gave the welcoming address.

J. E. McMurray read several of the 22 telegrams and 39 letters that had been received up to the time of the meeting. They included laudatory comments from Governor James F. Byrnes, the ASHVE Swiss Special Branch of Zurich, Switzerland, the Illinois Chapter and Past Pres. Reg. F. Taylor.

Prof. F. B. Herty of the University of South Carolina, School of Engineering, introduced the speaker of the evening, Pres. L. N. Hunter, who spoke on *Society Aims and Activities.* He explained the purposes of the Society and the principles it represents, and delineated its past history from the Charter membership of 75 in 1894 to a membership of 9300 in its 60th anniversary year. In his historical outline, he detailed the growth of the Society from its one Chapter to the 56th. Mr. Hunter stated that one of the most important functions of the Society is research in heating, ventilating, and air conditioning. He described the operation of the Society's Research Laboratory in Cleveland; the duties of the Committee on Research; how the various TA Committees develop research projects; and how research is sponsored at leading educational institutions.

In defining the future plans of the Society, the speaker dwelt on Society publications, THE GUIDE, the JOURNAL SECTION of *Heating, Piping & Air Conditioning,* and TRANSACTIONS. He told of their value in giving members reports and technical papers, news of individual members, Chapter affairs, and technical information. He listed the favorable effect on the public of such an outstanding reference book as THE GUIDE, as valuable to future progress.

Mr. Hunter concluded with the thought that members of the Society in their devotion to the advancement of the arts and sciences of heating, ventilating and air conditioning, are *Engineers of Human Comfort.*

L. L. Hyatt introduced ASHVE Executive Secretary A. V. Hutchinson, who spoke on *The Value of Chapter Membership* and then presented Chapter Record books.

President Hunter then conducted the election of Chapter Officers and members of the Board of Governors. Prof. F. B. Herty, chairman of the nominating committee, announced the slate of candidates as follows: *President*—R. F. Donovan, Columbia; *Vice President*—L. L. Hyatt, Spartanburg; *Secretary*—J. E. McMurray, Columbia; *Treasurer*—M. W. Rickenbaker, Jr., Summerton; *Board of Governors*—M. R. Durlach, Jr., Columbia, R. K. Rouse, Greenville, and H. L. McDowell, Columbia.

President Hunter asked for nominations from the floor, but as none was forthcoming, a motion was made, seconded, and carried that the nominations be closed. A voice vote then elected the slate of officers and board members.

President Hunter presented the Charter on behalf of the Chapter to its first President, R. F. Donovan.

He also presented Mr. Donovan with a gavel furnished by the Arizona Chapter to the new president of the Society's 56th Chapter.

President Donovan then took charge and announced that the May meeting would be the final date for candidates to apply and become listed as Charter members. The next meeting will be held in Spartanburg, May 10.

Before adjourning the meeting at 9:20 p.m., President Donovan conducted a question and answer period to allow members opportunity to ask President Hunter and Secretary Hutchinson questions relative to the Society and the Chapter operations.

SWISS SPECIAL BRANCH

In all probability, not all members are aware that the Society has a foreign Chapter. Although Switzerland is one of the smallest of nations, it is aggressive in its desire to learn more about providing comfort to its citizens. This ambition was manifested by the more than 20 scientists and engineers of that country who, in early 1952, petitioned ASHVE for a charter. The first meeting and Charter presentation was held in one of Switzerland's famous Alpine resorts, during September of 1952.

Since then, the Swiss Special Branch has grown and has shown continuous activity in research problems of ASHVE. When G. V. Parmelee, research associate of the Research Laboratory Staff in Cleveland, was returning from his tour as technical advisor to the Government of Israel, he stopped for the October 1953 meeting of the Swiss Special Branch. The members were eager to hear of his observations on Israel Climate Conditions, and were grateful for his explanation of the relationship of the Laboratory to the Society. The Branch showed its gratitude by holding a special reception for Mr. Parmelee. This appreciation of worthwhile information is indicated in its minutes of meetings. All secretaries and committees are extended thanks when they tender a report.

Walter Sennhauser, manager, Heating & Ventilating Department, Sulzer Brothers, Ltd., Winterthur, is chapter president; H. C. Bechtler, of Luwa, S/A. Anemonenstr 40, Zurich, is vice president; Walter Hausler, of Walter Hausler & Co., Ceresstrasse, Zurich, is secretary, and Hans (John) Frei, director, Sefrag, Bahnhoheweg 70, Berne, is treasurer.

Branch member Prof. Etienne Grandjean of the *Institute for Hygiene and Laborphysiology* at the Federal Technical University in Zurich was host for the January meeting. He conducted the members through the Institute, and enlivened the tour with vivid descriptions of various projects. He mentioned the activities and purposes of the Institute, and emphasized the investigations being conducted on the origin of silicosis, and tests to establish the physiological influence of vapors of solvents in industry, stressing the importance of air conditioning.

*Summary of Chapter Meetings**

- *ARIZONA*: H. E. Kraft called the February meeting to order at the Armed Services Officers' Club by reading the minutes of the previous meeting.

The following committee chairmen presented their reports: Research — H. G. Angerman; Membership — J. H. Futrelle; and Finance — J. J. Vargo.

Harold Ekman, architect and past president of the Arizona Chapter of *AIA* addressed the group. His subject concerned how the ASHVE and *AIA* could work together to solve mutual problems. His talk was interesting and enjoyable.

An entertaining film, presented by E. B. Bomar, on air distribution was shown after which the meeting was adjourned. Attendance 30. Attendance ratio 0.39.

- *ATLANTA*: The feature of the March meeting was the showing of a film by J. A. Marshall, chapter program chairman. The film, *Steam for Power,* was shown through the courtesy of the Babcock & Wilcox Co.

Pres. J. G. Croley presided over the meeting and announced that the report of the nominating committee would be presented at the April meeting and that the results of the election of officers would be announced at the May meeting. A discussion was held regarding whether the Chapter would send a representative to the Semi-Annual Meeting in Swampscott, Mass., but the decision was postponed until a later date. It was decided that an invitation be sent to the *ASRE* to attend the Chapter's annual dinner-dance in May. The meeting adjourned at 9:20 p.m. Attendance 41.

- *BRITISH COLUMBIA*: Twenty-four students and five faculty members of the University of British Columbia were among the guests attending the Chapter's March meeting. Pres. C. W. Leek opened the meeting with a warm welcome for the students and professors. Reports were then presented by the by-laws, special events and nominating committees.

E. H. Norton introduced the speaker, W. O. Stevens, consulting power plant engineer of Seattle and Vancouver, who spoke on *Design and Control Problems in Connection with By-Product Power Plants.* Mr. Stevens' talk was particularly interesting to the students, and Prof.

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*Note: The attendance ratios shown represent the membership attendance divided by the chapter membership. These ratios will be useful as a partial indication of interest shown by local chapter members in various types of subjects programmed by the various chapters and may be useful in deciding on subjects for chapter meetings.

W. O. Richmond, head of the University's Department of Mechanical Engineering, thanked the Chapter for its thoughtfulness in inviting the students to the meeting. Attendance 71. Attendance ratio 0.53.

• *CENTRAL NEW YORK*: Pres. C. R. Acheson called the February meeting to order by reading the minutes of the previous meeting. A report was submitted on the treasury, and a motion was made and seconded that the proposed changes in the constitution and by-laws of the Central New York Chapter be adopted as submitted and written by the legislative committee headed by E. L. Moyer.

J. F. Churan, Division of School Buildings and Grounds, New York State Education Department, New York, was the guest speaker for the evening. Mr. Churan discussed the latest phases of design both present and future, for New York State schools. His talk was well received and a lively discussion followed. Attendance 80. Attendance ratio 0.35.

• *CENTRAL OHIO*: The speaker of the evening was W. T. Van Orman, research engineer, The Goodyear Tire & Rubber Co., Akron, Ohio, who spoke on the development of self-charging electrostatic filters. Mr. Van Orman supplemented his talk with a very interesting series of slides and charts in connection with the device.

After calling the March meeting to order, Pres. N. T. Hess called for the reading of the minutes which were approved as read. A nominating committee was elected consisting of R. S. Curl, J. D. Slemmons, F. C. Seabright and R. M. Keatts. The meeting was adjourned at 9:40 p.m. Attendance 30. Attendance ratio 0.23.

• *CENTRAL OHIO*: J. E. Haines, Minneapolis, Minn., first vice president of the Society, was the Chapter's guest at its February dinner meeting. Mr. Haines, who was introduced by W. R. Kinney, spoke on the Society, covering its growth, the research program, increased membership, chapter growth and plans for increased contact with chapters from the headquarters office. He predicted that in the next 10 years the membership would increase from it present 9,400 to 20,000 members and from 55 chapters to 80.

The meeting was called to order at 7:15 p.m. in the Fort Hayes Hotel, and the minutes of the January meeting were read and approved. Attendance 56. Attendance ratio 0.42.

• *CINCINNATI*: Pres. R. C. Beineke called the meeting to order and introduced the guests present. The treasurer gave his report and reports were also given by the entertainment, publicity and meetings committees. H. E. Sproull, Society treasurer in 1951, gave a complete report on the 60th Annual Meeting in Houston.

The feature of the February meeting was a discussion by a panel made up of Chapter members. The moderator was R. S. Rose. Attendance 39. Attendance ratio 0.30.

• *CONNECTICUT*: Pres. G. F. Nieske called the March meeting to order, and urged that as many as possible attend the Semi-Annual Meeting to be held in Swampscott, Mass., June 28-30. The minutes of the February meeting were read and approved, and reports were presented by the membership and nominating committees. C. L. L'Hommedieu presented the treasurer's report.

Eric Roos, consulting engineer with Seelye, Stevenson, Value and Knecht, New York, N.Y., was introduced by R. B. Sweet. Mr. Roos spoke on *Engineering Problems in New York City*, in which he discussed the problems encountered by his firm in the greater New York area. He also described some interesting personal experiences encountered in his eight years of engineering work in the Middle and Far East. The meeting adjourned at 9:30 p.m. Attendance 46.

• *DELTA*: The program for the evening was a panel discussion on *Residential Air Conditioning*. W. B. Martin introduced the moderator, Chapter member J. E. Leininger, consulting engineer, who gave a brief talk on the past, present and future aspects of residential air conditioning. He then introduced the panel as follows: W. L. Clay, E. B. Tilton, I. M. Richardson, and G. H. Edwards, all Chapter members; and Clifford Woodward of General Electric Co. The panel discussion was both interesting and stimulating.

The February meeting was called to order by Pres. H. L. Salaun, who announced that the chapter by-laws were approved by the Council at the Annual Meeting. J. S. Burke and Walter Cooke, member and alternate on the Chapters Conference Committee, reported on the 60th Annual Meeting, announcing that Mr. Burke had been elected vice chairman on the Chapters Conference Committee. Attendance 68. Attendance ratio 0.30.

• *EMPIRE STATE CAPITAL*: This program was in the form of a panel discussion on controls, the panel members consisting of Mr. Waddell of Powers Regulator Co., E. J. Mahoney of Minneapolis-Honeywell Regulator Co., E. C. Doyle of Johnson Service Co., and Mr. Davis of Barber-Colman Co. Mr. Waddell discussed problems in zone control; Mr. Mahoney covered the cost of controls; Mr. Doyle discussed a school job that had both a zone and individual control system with the result that neither was operating correctly; and Mr. Davis related some electrical control problems he had encountered involving poor wiring installations. The discussion was followed by a question and answer period.

The March meeting was presided over by Vice Pres. E. C. Doyle, and H. S. Bond presented the nominating committee's report. Attendance 36. Attendance ratio 0.49.

• *GOLDEN GATE*: Pres. J. E. Murray called the meeting to order, and the minutes of the February meeting were read and approved. F. K. Crouch presented the treasurer's report, and Eric Roberts reported for the program committee while G. J. Yamas and D. E. McLeod presented the membership committee's report. G. N. Aranovsky made a report on his committee's investigation of possible meeting places.

The speaker at the March meeting was W. E. Gleeson, sales promotion manager, McDonnell & Miller, Inc., Chicago, Ill., who presented a very interesting talk on *Safety Controls of Steam and Hot Water Boilers.* The meeting adjourned at 9:45 p.m. Attendance 76. Attendance ratio 0.27.

• *ILLINOIS*: The March meeting was opened by Vice Pres. G. V. Zintel, who received reports from various committees regarding regular chapter business. Following the report of the Board of Tellers, M. J. Bamond, H. G. Chapin, J. F. Cummiskey, H. G. Gragg, E. P. Heckel, Jr. E. R. Teske, and G. V. Zintel were elected members of the nominating committee.

Vice President Zintel then turned the meeting over to J. A. Oberlin, who introduced the speaker, I. P. Sharpe, manager, Product Planning, Home Heating and Cooling Department, General Electric Co., Bloomfield, N.J.

Mr. Sharpe stated that sales of residential air conditioning reached a peak in 1952 with approximately 50,000 installations. This was because the public had been *conditioned* to air conditioning. Hot weather and lower prices of equipment resulted in substantial sales in the southern sections of the country.

According to the speaker, the popularity has now spread northward and the demand for residential cooling has reached the threshold of a general boom. Prices are lowering on residential equipment and many homes of the $12,000 class are now offered with cooling facilities.

Mr. Sharpe cited instances where new homes equipped with air conditioning have far outsold those without. Texas, New Jersey, New York and Pennsylvania had low-cost home projects with comfort conditioning, if desired. The homes with cooling facilities were much more in demand, and despite the added cost, were easier to sell.

Mr. Sharpe also pointed out that residential cooling has been held back because of water shortages in some localities, but cooling towers and air-cooled condensers can probably solve this problem. The southern part of the country requires ducts sized for the cooling load, but northern sections, in many cases, find ducts sized for heating which are also adequate for cooling.

The speaker said high-wall registers are better for cooling. In order to handle both heating and cooling from the same register, he recommended floor- or wall-type diffusers that discharge air vertically upward. At the conclusion of his talk, Mr. Sharpe answered questions from the members. Attendance 123.

• *INDIANA*: Prior to the meeting the Chapter was taken on a special tour of the *Powerama* display at the Allison Division of General Motors Corp. Dinner was served in the Allison Cafeteria.

Pres. R. C. Blackman called the meeting to order, and the treasurer's report was read and approved. R. G. Supple, president of the Student Branch at Purdue University, presented a report on progress that is being made in restoring the Student Branch to its former strength.

The speaker was George Klingman, who presented a talk on *Jet Aircraft Engines*, which was accompanied by the showing of a film. Attendance 70.

• *KANSAS*: Following a social hour and dinner, Pres. R. L. Pennington called the February meeting to order. Minutes of the previous meeting were read and approved, followed by the treasurer's report by T. L. Roberts.

Charles Yoe introduced the speaker, A. B. Newton, vice president, The Coleman Co., Inc., Wichita, who spoke on *Heat Pumps*. His interesting talk was followed by a question and answer period. Mr. Newton substituted for C. W. Nessell of Minneapolis-Honeywell Regulator Co., who was unable to attend. Attendance 27. Attendance ratio 0.30.

• *KANSAS CITY*: Pres. G. H. Stoffer called the March meeting to order at the Wishbone Restaurant by reading the minutes of the previous meeting. R. M. Spencer presented the treasurer's report and L. A. Heaven reported on the progress of arrangements for the coming spring social.

T. R. Wiley, chairman, and A. A. Zahner, vocational guidance committee, reported on their activities in talking to the various schools in the area.

A nominating committee was appointed by President Stoffer as follows: W. E. Howarth, W. A. Reichow, and C. W. Schumacher.

F. K. Ladewig introduced the guest speaker of the evening, W. T. Van Orman, research engineer for Goodyear Tire and Rubber Co. His subject was entitled *Self-Charging Electrostatic Air Filters* and his presentation was interesting and informative. Attendance 89. Attendance ratio 0.28.

• *MANITOBA*: Pres. A. K. Piercy called the February meeting to order at the Fort Garry Hotel. The minutes of the previous meeting were read and approved.

W. E. Gleeson, sales promotion manager, McDonnell & Miller, Chicago, Ill., was the guest speaker for the evening. He presented a very informative talk on *Safety Control Methods for Steam and Hot Water Systems.* The membership's keen interest in this subject was revealed by the many questions which followed Mr. Gleeson's talk. After A. J. McIntyre had thanked the speaker for his fine presentation the meeting was adjourned. Attendance 24.

• *MINNESOTA*: Vice Pres. J. A. Craig introduced G. C. Billings, advertising and public relations director of the G. A. Tennant Co., Minneapolis, Minn., who had consented to speak in place of O. C. Hognander, who was unable to attend. Mr. Billings spoke on *Bridging the Gap Between Sales and Engineering.*

Pres. V. E. Pearson presided over the March meeting, and he presented a report on the 60th Annual Meeting which we had attended as the Chapter's representative on the Chapters Conference Committee. He announced that 20 Chapter members had attended the meeting and that M. S. Wunderlich had been elected chairman of the Society's Nominating Committee.

The members of the Chapter's nominating committee were elected as follows: Prof. A. B. Algren, E. F. Snyder, Jr., H. C. Mills, D. M. Forfar and O. L. Lilja. The committee was asked to submit a ballot at the April meeting and the election and installation of officers would take place at the May meeting. Attendance 107.

• *MONTREAL*: Pres. B. J. Horsburgh presided at the February meeting of the Montreal Chapter which was called to order in the Windsor Station Restaurant. The minutes of the previous meeting were read by Robert Clapperton and approved by the membership.

J. F. Gschwind, Ross Engineering, New York, was the guest speaker of the evening. Mr. Gschwind gave an interesting talk concerning the hot water field in Europe and America. His talk was well illustrated by slides and with his vast experience his subject was most interesting. G. L. Wiggs thanked Mr. Gschwind for his fine presentation and the meeting was then adjourned. Attendance 84.

• *NEBRASKA*: Pres. O. J. Smith presided over the March meeting, which was held in the Rome Hotel. The speaker, P. A. McLeod, is manager of the Centrifugal Refrigeration Section of Worthington Corp., Harrison, N. J. Mr. McLeod's illustrated talk was well received and was followed by an interesting question and answer period. The meeting was adjourned at 8:45 p.m. Attendance 43.

• *NEW YORK*: Pres. J. E. Schechter called the March meeting to order at 7:45 p.m., following a social hour and dinner. After the minutes were read and approved, he read the names of seven new members of the Chapter: J. L. Alteri, M. F. Brown, Joseph Ferrarini, R. S. Funk, S. H. Jarcho, Maurice London and A. L. Zinman.

Vice Pres. R. L. Stinard, program chairman, introduced the speaker, M. W. Rees, technical advisor, Owens-Corning Fiberglas, Toledo, Ohio, who chose as his subject, *Acoustics and the Air Conditioning Industry*.

Mr. Rees first explained that architectural acoustics is divided into three parts; to provide good listening conditions in radio and recording studios and in auditoriums; to reduce noise in offices, restaurants, corridors and work areas; to reduce the transmission of sound through building structures and to insulate against airborne and impact sound.

He stressed the importance of reverberation time or the persistence of sound within an enclosed area after the source of sound has been closed off. It is the time required for a sound with an initial intensity of 1,000,000 units to decay or die out to an intensity of one unit. If the reverberation time is too short the room may feel dead and there will be difficulty in hearing; too long a time causes a disturbing overlap of speech syllables.

A fundamental requirement in proper acoustics is the insulation against noise within an area. Design for quiet operation by creators of office machine and recording devices is an aid. The next step is absorption of air-borne sounds with highly absorptive insulating materials.

Mr. Rees held a question and answer period at the end of his interesting and informative talk. Attendance 75. Attendance ratio 0.13.

• *NORTH JERSEY*: Presiding officer at the March meeting was Pres. F. H. Faust, who called for a report from the nominating committee, consisting of A. A. Bearman, H. S. Wheller and L. G. Huggins. It was announced that election of officers would take place at the April meeting. H. M. Patrick, program chairman, reported on the proposed program for the April meeting and the social affair to be held in June.

The speaker, Dr. A. E. Sirosky, chief engineer, U. S. Testing Co., Hoboken, N. J., was then introduced. Dr. Sirosky spoke on *Climatic Test Equipment — Air Conditioning Equipment Carried to Extremes*, and supplemented his interesting presentation with slides. Attendance 80.

Society To Participate in Indoor Comfort Exposition

Arrangements have been completed for the ASHVE to participate in the National Indoor Comfort Exposition to be held in Philadelphia's Commercial Museum, May 16 to 20, 1954.

The exposition, sponsored by the *Oil-Heat Institute* and formerly known as the Oil-Heat Show, is expected to attract some 25,000 to see new equipment in the heating and cooling fields.

The Society, through its Research Laboratory and in cooperation with the Philadelphia Chapter, will present a demonstration of the ASHVE Low-Inertia, Low-Resistance Heat Flow Meter, and a display of the effects of various colored glass on solar radiation.

The Society's exhibit, in booth 774, will also review studies which have been conducted on pulsation in oil burner flames and on barometric draft controls.

• *NORTH TEXAS*: The March meeting was called to order by Pres. M. W. Brown in the Melrose Hotel. Members introduced themselves and their guests, and the new members were introduced. T. H. Anspacher reported that the memorial in honor of the late Dr. F. E. Giesecke, a past president of the Society, should begin functioning late this year. President Brown then announced that a letter of congratulations had been sent to the new Chapter chartered in Columbia, S. C.

Ross Zumwalt introduced the speaker, Wayne Rudmose, professor of physics at Southern Methodist University, who discussed *How Noise Affects Your Hearing*. The discussion was well received and provoked an interesting question and answer period. Attendance 97. Attendance ratio 0.43.

• *NORTHEASTERN OKLAHOMA*: The February meeting was called to order by Pres. R. W. Winget at the University of Tulsa.

R. F. Shoemaker reported on the Chapters Conference Committee meeting held in conjunction with the Annual Meeting in Houston. He outlined the focal points of the meeting and especially stressed the campaign for new members.

J. B. Killebrew, Killebrew Engineering Co., St. Louis, Mo., was the guest speaker of the evening. He discussed the advantages and disadvantages of the different types of liquid heat exchangers, and referred particularly to the maintenance problems encountered in each type of heat exchanger. An interesting question period followed. Attendance 27.

• *NORTHERN OHIO*: The February meeting was called to order by Pres. J. M. Black at the Allerton Hotel's Mather Room, Cleveland. The minutes of the December meeting were approved as read and D. E. Mannen presented a report of the 60th Annual Meeting which he attended in Houston.

E. F. Morse, membership chairman, announced that several new members had been accepted into the local chapter and H. R. Canoyer, program chairman, discussed the programs for the coming months.

Mr. Canoyer introduced G. V. Parmelee, research associate, ASHVE Research Laboratory in Cleveland, who gave an interesting description of his recent trip abroad. He told of unusual problems in air conditioning in the areas he visited. His talk was very interesting and greatly enjoyed by all. Attendance 64.

• *NORTHERN PIEDMONT*: Pres. R. B. Crosland called the February meeting to order at Bliss' Restaurant, Greensboro, N. C. The minutes of the previous meeting were approved as read and President Crosland then reported on his trip to Houston for the Annual Meeting.

G. H. Ficken, program chairman, introduced the guest speaker, J. G. Hopping, Jr., Piedmont Natural Gas Co., Charlotte, N. C. Mr. Hopping's talk was entitled *Gas Firing*, and a film illustrating some of the construction aspects of the natural gas distribution system accompanied his talk. After an exceedingly interesting discussion period the meeting was adjourned. Attendance 63.

• *OKLAHOMA*: A. C. Shelley, program chairman, introduced J. J. Willis, chief fan application engineer, American Air Filter Co., Inc., Louisville, Ky. Mr. Willis spoke on *Air Handling Devices*, giving a general review of the many types of fans and air moving equipment on the market today for general, commercial, and industrial applications. He dealt primarily with centrifugal blowers and stressed the importance of the use of manufacturer's fan performance curves in the selection and application of centrifugal blowers. The significance of fan performance curves was explained and recommendations were made for the selection of fans in accordance with the curves.

Following the opening of the March meeting, a nominating committee was elected consisting of R. L. Williams, W. D. Henke and J. E. Montin. The committee was instructed to report at the April meeting. Attendance 48. Attendance ratio 0.44.

• *ONTARIO*: Pres. N. W. Kingsland called the March meeting to order at the Royal York Hotel. New members were introduced by F. D. Ledgett and President Kingsland announced that M. K. Bowman would be chairman of the Spring Golf Meeting which is to be held in June at the Cedar Brae Country Club.

G. A. Taylor, Bogue Electric Co., Toronto, Canada, was the guest speaker of the evening. Mr. Taylor's talk was entitled *External Treatment of Boiler Feed Water and Cooling Water*. The discussion was centered around the subject of treating boiler water for small heating installations in order to avoid corrosion. Mr. Taylor's talk was well received and after a lively discussion period the meeting was adjourned. Attendance 86.

• *ONTARIO*: Pres. N. W. Kingsland called the February meeting to order at the Royal York Hotel. J. H. Ross reported on the activities of the Annual Meeting at Houston and Council Member J. H. Fox brought the Chapter up to date on the Canadian Research Program at Queens University.

This meeting was a special meeting in that the Ontario Chapter invited all the members of the University of Toronto Student Branch as their guests. Twenty-four student members were in attendance.

Dean K. F. Tupper, Faculty of Applied Science and Engineering, University of Toronto, was the guest speaker of the evening. Dean Tupper projected the thinking of his audience to the year 2154 A.D. with his subject *Future Trends and Developments in Heating and Ventilating*. His talk was most unusual and a lively discussion period followed. Attendance 129.

• *OREGON*: J. Donald Kroeker, E. E. Kelly and B. W. Farnes gave a report on the activities at the Society's 60th Annual Meeting in Houston. Mr. Kroeker reported on the first and third technical sessions, also giving the highlights of the Annual Banquet. The second technical session and the Chapters Conference Committee meeting were covered by Mr. Kelly; and Mr. Farnes recounted proceedings during part of the third session and all of the fourth session. It was announced that Mr. Farnes had been elected a member of the Society's Council during the Annual Meeting.

Pres. A. N. Hoss presided at the February meeting. The minutes of the January meeting were approved as read, and T. E. Taylor, chairman of the nominating committee, presented his committee's report. Attendance 56. Attendance ratio 0.35.

• *OTTAWA VALLEY*: The First Vice President of the Society, J. E. Haines, Minneapolis, Minn., was the guest of honor at the Chapter's March meeting. Mr. Haines outlined the activities and growth of the Society indicating that within the past 10 years the membership has grown from 3,000 to over 9,000 members, keeping pace with the tremendous growth of the heating, ventilating and air conditioning industry.

A nominating committee was elected as follows: C. E. W. Watson, A. H. Hargreaves and Jacob Klassen.

The speaker of the evening was H. G. S. Murray, president, Murray Air Conditioning, Ltd., Montreal, Que., who spoke on the difference between comfort air conditioning and industrial air conditioning. Mr. Murray stated that in designing for industrial air conditioning it is sometimes impossible to consider comfort for the workers, while again in another type of installation comfort might be the prime consideration, as statistics prove that output per man hour is increased with the use of comfort air conditioning.

He indicated that a great majority of the public is unaware of the part air conditioning plays in the manufacture of everyday products and which, without the use of air conditioning to control the various phases of its manufacture, would not achieve the fine quality which we know today. A few of these include cigarettes, cigars, beer, liquor, television tubes, banknotes and fine precision machinery. Attendance 40. Attendance ratio 0.60.

• *OTTAWA VALLEY*: Pres. G. L. Ostiguy called the February meeting to order and proceeded to read the minutes of the previous meeting.

President Ostiguy then called upon E. J. Schoenherr for the treasurer's report and W. J. Robinson, member of the Chapter's Conference Committee, presented his report on the Annual Meeting.

The guest speakers of the evening were C. W. Wheeler and Mr. Pandy of the Ric-wiL Co. Mr. Wheeler gave a brief resume of the pre-fabricated piping for both outside and underground piping. Mr. Pandy illustrated with slides the various types and combinations of piping assemblies. Both men answered questions and an interesting discussion followed. Attendance 36. Attendance ratio 0.44.

• *PACIFIC NORTHWEST*: T. C. Caskey presided in the absence of Pres. H. T. Orebaugh and called for the introduction of guests and new members. Mr. Caskey, who is a member of the Society's Chapters Conference Committee, reported on the 60th Annual Meeting in Houston. C. W. May made a report for the committee for boiler code review, and R. M. Stern reported concerning the need for the drafting and approval of a new county plumbing ordinance, developed along the lines of the existing Seattle ordinance recently passed.

Carl Croson, attorney at law and senior member of the firm of Croson, Johnson, & Wheelon, was speaker of the evening. Mr. Croson's topic was *Legal Contracts*, which was interesting and informative and well received. The meeting adjourned at 9:05 p.m. Attendance 45. Attendance ratio 0.41.

• *PITTSBURGH*: E. C. Hach introduced Paul Schell, vice president of the Pittsburgh Chapter of the *American Institute of Architects*, as the moderator for the panel discussion on *Specifications*. The first speaker, T. F. Rockwell, representing the engineer, defined what the term, specifications, actually means to an engineer. He also covered the legal aspects of the contract, and stated that the obligations of the engineer are to be reasonably clear and accurate, fair and willing to correct mistakes.

J. W. Soffel spoke from the contractor's viewpoint. He stated that time is a very important consideration as he feels that most architects and engineers allow less time than is actually needed to figure a job.

Speaking for the salesman or supplier, H. W. Rainey, Jr., stated that he felt that architects and engineers should specify standard equipment rather than custom made equipment.

Pres. C. H. Schneider called the March meeting to order, and G. L. Simpson presented the report of the nominating committee. Attendance 103.

• *SACRAMENTO VALLEY*: Pres. E. C. McKinsey presided at the March meeting, and gave a brief resume of the proceedings at the 60th Annual Meeting in Houston. V. W. Thornburg presented the treasurer's report, and committee reports were presented by the following: S. W. Doolittle, membership; J. E. Marshall, program, and F. E. Hawley, research.

Eric Roberts of the Golden Gate Chapter introduced W. E. Gleeson, sales promotion manager, McDonnell & Miller, Inc., Chicago, Ill. Mr. Gleeson stressed the importance of controlling energy if safety is to be achieved and recommended following the *ASME* Code rules in system design and installation. He stated that steam boilers are equipped regularly with adequate safety controls while not water boilers are not. Mr Gleeson then discussed at length the proper applications of pressure and thermal relief valves. Attendance 51. Attendance ratio 0.41.

• *SACRAMENTO VALLEY*: The February meeting was called to order at the Coral Reef Restaurant by Pres. E. C. McKinsey. President McKinsey then called for committee reports and the treasurer's report, which was given by V. W. Thornburg.

A. L. Bounaccorsi, consultant engineer, Bounaccorsi, Murray and Lewis, was the guest speaker of the evening. Mr. Bounaccorsi's talk was entitled *Mechanical Equipment for Hospitals*. The talk covered the various types of mechanical equipment that goes into a modern hospital, including heating systems, air conditioning systems, etc. His discussion was very well received and a lively question session followed. Attendance 48. Attendance ratio 0.45.

• *ST. LOUIS:* The St. Louis Chapter March meeting was opened at 7:30 p.m. in Town Hall, March 9, by Pres. H. C. Sharp, with 35 members and 18 guests present.

B. L. Evans made a report on the Annual Meeting in Houston; President Sharp reported on the meeting of the Chapters Conference Committee; W. A. Russell, chairman of the Finance Committee, discussed chapter finances and told of negotiations for purchase of bonds; and F. E. Ince, treasurer, announced how many members were delinquent in their dues.

C. A. Murphy, chairman of the Dance Committee, announced that the Spring Dance was scheduled for May 22 in the Palm Room of the Kingsway Hotel. G. B. Pattis, chairman of the Blood Bank Committee, announced that 13 more persons had made definite dates for donations, and that this brought the chapter quota up to date. E. T. Clucas, chairman of the Publicity Committee, discussed plans for formation of an editorial staff to edit and publish a chapter publication. G. W. F. Myers, B. L. Evans, and E. E. Carlson were appointed as a committee to investigate the feasibility of such a paper.

G. H. Bemarkt, chairman of the Meetings Committee, introduced the speaker, J. J. Blackmore, sales engineer for Bell & Gossett Co., Morton Grove, Ill. In his introductory remarks, Mr. Bemarkt stated that Mr. Blackmore had been in the radiant heating business for 20 years.

Mr. Blackmore spoke on the subject, *Trouble and Problems of Hot Water Radiant Panel Heating*, and stated in his opening remarks that tremendous progress in this field has been noted in the last 20 years. His belief is that many faults of the system are caused by flaws in basic design for structural conditions.

As major contributions to insufficient service, the speaker listed floors laid over wet ground or cinder fill, or without proper insulation around the edge of the building; improper controls; too great a pressure drop in coils; oversize pipe; and incorrect location of balance valve. He recommended that the heat pump be operated continuously as long as there is any appreciable heat in the boiler.

Following his talk, Mr. Blackmore held a question and answer period in which he was assisted by A. E. Mayer of the A. E. Mayer Plumbing and Heating Co.

• *UTAH*: Pres. M. L. Gollaher presided at the March meeting. The minutes of the February meeting were approved as read and D. R. Wilde reported on preparations which are being made for the Air Conditioning, Heating and Ventilating Conference to be held at the University of Utah on April 29 and 30.

J. W. McElgin, engineer, J. J. Nesbitt, Inc., Philadelphia, Pa., spoke on *Unit Ventilation Applications As Applied to Modern Classrooms.* Mr. McElgin discussed the trend toward reducing cost of initial heating installations through simplified controls, realistic appraisal of the design day and corridor ventilation. He pointed out the increasing use of hot water systems, with possible lower first cost and greater flexibility of control. His presentation was illustrated with slides showing charts and diagrams. Attendance 27.

• *UTAH*: The speaker at the February meeting was R. H. Nelson, American Air Filter Co., San Francisco, who spoke on *Classroom Heating and Ventilation.* He presented an illustrated lecture on a series of tests conducted at the George Washington Grade School in Moline, Ill., to determine the heating and cooling requirements of modern classrooms. The results of the tests emphasized the need for controlled cooling during the heating season. The internal heat gain, plus the solar radiation, provided sufficient heat to heat the south and east rooms with outside temperature as low as 32 F. Hence these rooms required some cooling during most of the school day hours.

When President Gollaher called the meeting to order, the minutes of the previous meeting were read and approved. E. V. Gritton reported on the 60th Annual Meeting in Houston. Attendance 20.

• *VIRGINIA*: Pres. E. D. Duval called the meeting to order at 7:30 p.m., following dinner in the banquet room of Carl Parker's Restaurant, Norfolk. The Reverend E. K. Emurian gave a most interesting and enjoyable talk.

The only order of chapter business was the election of officers for 1954-55. Those elected were: *President*—H. E. Marquart; *Vice President*—T. B. Carpenter; *Secretary*—R. L. Burton, Jr.; *Treasurer*—C. G. Conaway, Jr.; *Board of Governors*—M. H. Pelosi and E. R. Simpson, Jr. Attendance 44.

• *WEST TEXAS*: Pres. L. C. McKay called the meeting to order by reading the minutes of the previous meeting which were approved as read.

A short sound movie of the 1953 World Series was presented by Raymond Winkler, manager of the Lubbock Hubbers. The movie proved to be very enjoyable and a vote of thanks was extended to Mr. Winkler for his efforts. Attendance 25.

STUDENT BRANCH

• *PURDUE UNIVERSITY*: The Purdue Student Branch met with the Indiana Chapter at Allison Division of General Motors Corp., Indianapolis, Ind., on February 23.

The *Powerama Exhibit* of cutaway jet engines, turboprop engines and other equipment manufactured by Allison Division were inspected by the group. Following a movie, *Harnessed Lightning*, the students participated in a lively discussion of jet-powered airplane performance. The meeting was very successful and some valuable information was gained by all present. Attendance 21.

JOURNAL SECTION

Candidates for Membership

The Society's By-Laws require that all applications for membership or advancement are to be sent to the Executive Secretary and the names of applicants and their references shall be printed in the next issue of the Journal of the Society, or mailed to all members. When the replies are received from references the Candidate's application shall be submitted to and acted upon by the Admission and Advancement Committee as soon as possible.

When the Admission and Advancement Committee has acted favorably upon a Candidate's application and assigned his grade, the Council shall confirm the election of the proposed Candidate for membership. During the past month there have been 123 applications for membership, including 5 student applications and 8 reinstatements; in addition 9 advancements have been received. The names of these men and their sponsors are published in the following list.

Members are requested to scrutinize the list with care. The Admission and Advancement Committee, and in turn, the Council, urge members to assume their share of responsibility of receiving these candidates into membership by advising the Executive Secretary promptly of any whose eligibility for membership is in any way questioned.

All correspondence in regard to such matters is strictly confidential, and is solely for the good of the Society, which it is the duty of every member to promote.

Unless objection is made by some member by May 31, 1954, these candidates will be voted upon by the Council. Those elected to membership will be notified by the Executive Secretary immediately after election.

Note: †Reinstatement. *Non-member. △Advancement.

Alabama

Miller, E. B., Jr., Mech. Engr., Van Keuren, Davis & Co., Birmingham. References: C. M. Ashley, R. B. Dowdey, A. L. Hesselschwerdt, Jr., H. K. Walden.

California

†Corbett, C. L., Jr., Engr., Ford Heating Co., Pomona. References: L. B. Davenport, J. S. Earhart, J. R. Hall, T. H. Parry.

Miculich, E. A., Mech. Designer, Austin Co., Los Angeles. References: W. E. Barnum, Jr., J. S. Earhart, J. F. Park, J. J. Wodal.

Tappendorf, W. A., Jr., Engr., Harry F. Haldeman, Inc., Los Angeles. References: Carlyle Artran, N. N. Dahl, F. M. Neal, H. P. Sheldon.

Connecticut

Pfanstiehl, P. D., Appl. Engr., Empire State Equipment Co., Manchester. References: K. G. Burr*, W. Mounce*, R. C. Murphy, R. P. Sullivan.

Rossi, E. J., Prod. Control Mgr., Anemostat Corp. of America, Hartford. References: Elliot Godes, Fritz Honerkamp, E. J. McArdle, W. J. Waeldner.

District of Columbia

△Frederick, V. L., Owner, V. L. Frederick Co., Washington. References: A. E. Beitzel, A. C. Crawford, Leonard Holder, D. E. Shytle*.

Werner, R. F., Engr., John G. Webster & Sons, Inc., Washington. References: J. J. Chaconas, J. G. Muirheid, G. C. Webster, J. G. Werner.

Florida

Saymon, B. J., Mech. Engr., Reynolds, Smith and Hills, Cons. Engrs., Jacksonville. References: F. J. Beckwith, T. W. Bostwick*, R. J. Clark, M. J. Wilson.

Wentz, C. M., Air Cond. Engr., Florida Power Corp., St. Petersburg. References: R. J. Clark, G. C. Hall, S. F. Graziano, T. R. Yarborough.

Georgia

Seckman, T. C., Appl. Engr., Carrier Corp. Atlanta. References: E. A. Anderson, J. S. Edgar, S. F. Krogstad, D. R. Langford.

Smallwood, C. E., Engr., Johnson Service Co., Atlanta. References: J. M. Lazenby, H. K. McCain, W. P. West, K. A. Wright.

Illinois

Mathis, Bill, Asst. Sales Mgr., New York Blower Co., Chicago. References: L. B. Davenport, J. W. Mathis, T. H. Ray, Jr., H. C. Sharp.

△Olszewski, H. E., Designer, Neiler, Rich & Bladen, Engrs., Chicago. References: A. M. Bladen, E. T. Fredericks, Jr., F. H. Markus, A. O. May.

Peterson, J. M., Jr., Cons. Engr., Worthington Corp., Chicago. References: A. H. Blaker, E. R. Gritschke, J. A. Oberlin, F. W. Riederer.

Indiana

Lee, J. T., Mech. Engr., Everett I. Brown Co., Architects & Engineers, Indianapolis. References: F. A. Arzet, W. R. Fenstermaker, George Heidenreich, J. W. Jackson.

Kansas

Dagenais, R. W., Research Engr., The Coleman Co., Inc., Wichita. References: J. W. Kice, M. E. Meyer, A. B. Newton, N. B. Watkins.

△Skalla, H. M., Design Engr., Oakle P. Bullock, Cons. Engr., Wichita. References: D. M. Allen, R. F. Bauer, O. P. Bullock, A. P. Francis.

Tudor, K. W., Owner, Tudor Engineering Co., Shawnee. References: E. L. Burnett, J. S. Dukelow, H. L. Lamborn*, Harold Novak*.

Kentucky

Zoeller, R. F., Htg. Engr., The Zoeller Co., Louisville. References: W. B. Linkhorn*, C. E. McNeal*, J. W. Nuss*, Berton Van Dyke*.

Louisiana

Braswell, M. H., Mgr. & Co-Owner, Insulation Division, National Roofing Co., New Orleans. References: J. T. Knight, Jr., W. B. Moses, Jr., I. M. Richardson, E. O. Thoman.

Servat, R. C., Jr., Repr., General Controls Co., New Orleans. References: J. O. Breeden, H. N. Stall, L. T. Vivien, J. D. Whittaker.

△Sullivan, G. E., Engr., Carrier Corp., New Orleans. References: L. V. Busenlener, W. B. Martin, Jr., E. H. Sanford, E. O. Thoman.

Maryland

Fleishman, Jay, Vice Pres., Shurfire Fuel Products Inc., Silver Spring. References: J. J. Chaconas, A. B. DeVore, W. F. Goddard, Barney Menditch.

Kausch, W. J., Engr., The Shields Commonwealth Co., Baltimore. References:

M. S. Hall*, J. E. Malone, R. J. Smith, J. K. Wolford.

Massachusetts

△Priestly, D. W., Engr., Massachusetts Heating Corp., Boston. References: A. B. Coop*, F. W. Cooper*, A. R. Stanley*, R. Thornton*.

Ruiz-Gil, Donato, Graduate Student, Harvard Graduate School of Applied Sciences, Cambridge. References: Philip Drinker*, Leslie Silverman*, Marianne Sugarman*, C. P. Yaglou.

Michigan

Gray, Henry, Draftsman & Designer, Giffels & Vallet, Inc., Detroit. References: Al Ewert*, Frank Girardot*, Larry Harper*, J. E. Schultz*.

Greig, J. D., Sr., Secy. & Chief Engr., Johnson Larsen & Co., Detroit. References: G. W. Akers, L. A. Burch, R. M. McIntosh, R. H. Oberschulte.

Johnson, F. L., Pres., Johnson, Larsen & Co., Detroit. References: W. G. Boales, Jr., E. F. Glanz, E. R. Harrigan, R. H. Oberschulte.

Kusch, F. M., Designer & Draftsman, Joseph C. Goddeyne, Architect, Bay City. References: J. C. Goddeyne, J. B. Heaton, F. X. Marzolf, O. F. Preuthon.

†Rowland, R. S., Engr., Tranter Mfg., Inc., Lansing. References: J. T. Anderson, F. W. Brundage, L. C. Price*, C. H. Pesterfield.

Witkowski, J. S., Mech. Engr., Smith-Hinchman & Grylls, Inc., Detroit. References: J. B. Freeman, T. C. Schwer, R. C. Stark, J. J. Uicker.

Minnesota

Baker, E. J., Owner, The E. J. Baker Co., St. Paul. References: L. J. Blazek, R. W. Evans, William Sturm, C. C. Wells.

La Valley, G. E., Engr., Htg. & Air Cond. Dept., McQuay Inc., Minneapolis. References: A. W. Anderson*, Irvin Hensch*, W. H. Markson, Henry Williams.

Missouri

Cawley, William, Design Engr., Bank Building Corp. of America, St. Louis. References: W. L. Ashton, W. D. Braden, E. T. Clucas, Ben McDougall*.

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Cohen, Frederic, Pres., Air Mart Equipment Co., Inc., Kansas City. References: Vance Elders*, Fred Estrin*, David Gottlieb*, C. W. Schumacher.

Hartung, C. M., Chief Designer, Ferris & Hamig, Cons. Engrs., St. Louis. References: E. E. Carlson, L. L. Hamig, N. J. Hubbuch, Jr., H. C. Sharp.

Hollasch, R. E., Mech. Designer, Black & Veatch, Cons. Engrs., Kansas City. References: J. R. DeRigne, B. F. Meador*, J. C. Robbins, A. J. Sneller.

Londe, Paul, Mech. Engr., Fruin-Collion Contracting Co., St. Louis. References: H. R. Halt, D. E. Hanlon, J. B. Killebrew, H. C. Sharp.

Mattlage, R. F., Mech. Engr., Bank Building & Equipment Corp. of America, St. Louis. References: W. L. Ashton, Jr., E. T. Clucas, B. C. Compton*, O. L. McCallister*.

Olson, R. E., Repr., American Radiator & Standard Sanitary Corp., Kansas City. References: F. F. Dodds, R. M. Miller, P. A. Moreno, R. W. Tobey.

Pulkinghorn, J. W., Chief Engr., Hydraline Products Div., Borg-Warner Corp., Detroit. References: Ken Flint*, M. H. Hofmeister, H. R. Limbacher, V. W. Mayer.

Ryer, J. C., Jr., Mech. Engr., Edison Bros. Stores, Inc., St. Louis. References: E. L. H. Hoffmann*, R. J. Noland*, George Robinson*, H. C. Sharp.

New Jersey

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Freeman, G. A., Engr., W. I. Freeman & Co., Inc., Newark. References: P. R. Achenbach, G. G. Luce*, A. E. Manning*, T. Phillips*.

Harden, T. R., Engr., L. J. Wing Manufacturing Co., Linden. References: E. H. Hubert*, T. R. Peyrek, C. H. Smith, H. S. Wheller, Sr.

McKiernan, J. P., Engr., L. J. Wing Manufacturing Co., Linden. References: E. H. Hubert*, T. R. Peyrek, C. H. Smith, H. S. Wheller, Sr.

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New Mexico

Eglinton, T. W., Associate Member, Dr. Marcello Giomi, Cons. Engr., Albuquerque. References: W. L. Beale, Marcello Giomi, J. K. James, H. K. Pride.

Patch, G. C., Engr., Minneapolis-Honeywell Regulator Co., Albuquerque. References: W. L. Beale, J. K. James, W. L. Jones, H. F. Munn.

†Sebree, G. M., Partner, Sebree-Huff Equipment Co., Albuquerque. References: F. H. Bridgers, J. M. Huff, C. S. Leopold, L. C. Pellegrini.

New York

Friedland, A. L., Mech. Engr., J. C. Penney Co., New York. References: J. H. Beck*, R. L. Bloch*, R. A. Schauer, R. L. Stinard.

Grad, Ian, Sr., Mech. Project Engr., Voorhees, Walker, Foley & Smith, New York. References: V. J. Cucci, Herbert Pomerantz, C. P. Roberts, Daniel Speigel.

Gruman, L. B., Jr., Acting Secretary, Heating, Piping & Air Conditioning Contractors National Association, New York. References: P. A. Edwards J. C. Fitts, R. M. Getschow, P. B. Gordon.

Haubner, A. E., Engr., Precision Sheet Metal Works, Syracuse. References: C. R. Acheson, A. L. Jones, P. D. Robson, C. F. Woese.

Morgan, H. R., Chief Designer Draftsman, Levy & O'Keefe, Cons. Engrs., New York. References: P. W. Balsam*, Joel Blau*, J. M. Levy, Norman Unger.

Myers, Raymond, Pres., R. D. Myers, Inc., Norwich. References: D. J. Girard, H. K. Ormsby, J. W. Stevens, C. F. Woese.

Smith, R. C., Jr., Mgr., Lawler Automatic Controls Inc., Mt. Vernon. References: Henry Boemi, H. N. Seelinger, Clifford Strock, H. J. Twine.

North Carolina

Baker, J. E., Engr., Thomas A. Cooper Co., Charlotte. References: Charles Petty, A. Z. Price, L. F. Lawrence, Jr., R. O. McGary.

Gusler, D. L., Design Engr., Watson and Hart, Engrs., Greensboro. References: J. E. Hart, T. C. Heyward, Jr., L. B. Hoffman, R. K. Hunter.

Lee, N. E., Pres., J. R. Bagwell Co., Durham. References: F. T. Daddario, F. J. Reed, Alton Skinner, Jr., W. M. Wallace II.

Ohio

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†Benedict, E. R., Vice Pres., The Ric-wiL Co., Barberton. References: C. T. Brennan, A. M. Fenwick*, A. L. Vanderhoof, C. W. Wheeler.

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Boes, P. J., Cons. Engr., Toledo. References: C. C. Britsch*, H. W. Dirks, C. F. Hoffman, F. C. Richardson, Jr.

△Buddemeyer, H. J., Industrial Gas Engr., Dayton Power & Light Co., Dayton. References: D. L. Bergman, L. P. Brehm, R. F. Johnson, J. B. Rishel.

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Gray, H. E., Owner, Gray Equipment Sales Co., Toledo. References: T. F. Geikie, C. F. Hoffman, A. H. Lumm, Jr., E. E. Trickler.

Harpst, C. H., Secy., The Hoffman & Harpst Co., Toledo. References: James Dinwiddie*, William Richards*, A. Riedmayer*, Clarence Wilt*.

Harpst, G. P., Designer, The Hoffman & Harpst Co., Toledo. References: William Armstrong*, Carl Biebeshiemer*, James Dinwiddie*, Edward Granda*.

Hildebrand, F. J., Pres., Fred J. Hildebrand Heating & Plumbing Co., Inc., Toledo. References: F. A. Edgington, J. F. Guest, C. F. Hoffman, F. C. Richardson, Jr.

Klemens, R. V., Chief Engr., Toledo Metropolitan Housing Authority, Toledo. References: F. A. Edgington, J. F. Guest, C. F. Hoffman, F. C. Richardson, Jr.

Konter, R. P., Engr., Johnson Service Co., Toledo. References: F. A. Edgington, J. F. Guest, C. F. Hoffman, F. C. Richardson, Jr.

MacDermid, D. W., Owner, Plumbing & Heating Contractor, Toledo. References: F. A. Edgington, J. F. Guest, C. F. Hoffman, F. C. Richardson, Jr.

Mandell, R. H., Repr., Gray Equipment Sales Co., Toledo. References: L. C. Baxter*, P. J. Fuller*, H. E. Gray*, A. H. Lumm, Jr.

Moore, R. L., Repr., The Trane Co., Cincinnati. References: A. W. Edwards, I. G. Edwards, G. R. Murphy, M. R. Paulsen.

Osterhourt, F. W., American Radiator & Standard Sanitary Corp., Toledo. References: H. W. Dirks*, F. A. Edgington, J. F. Guest, G. W. Palmer.

Pierce, W. S., Pres., Ray Heat & Power Co., Cincinnati. References: F. B. DeBra, C. H. Koper, W. H. Junker, O. W. Motz.

Weaver, R. S., Engr., Atlas Engineering Co., Toledo. References: C. R. Chappelear*, F. A. Edgington, R. I. Fruth*, Charles Knisly*.

Wilkie, J. E., Engr., F. C. Richardson, Jr., Toledo. References: F. A. Edgington, C. F. Hoffman, F. C. Richardson, Jr., A. L. Vanderhoof, Sr.

Wilson, D. L., Br. Mgr., American Blower Corp., Toledo. References: V. P. John*, J. J. Nesbitt, Jr.*, E. W. Peterson*, H. E. Paetz.

Wulczak, W. J., Repr., Amstan Supply Division, American Radiator & Standard Sanitary Corp., Toledo. References: F. A. Edgington, J. F. Guest, C. F. Hoffman, F.C. Richardson, Jr.

Oklahoma

Bolls, A. W., Jr., Mgr., Bolls Supply Co., Oklahoma City. References: W. J. Collins, Jr., F. R. Denham P. F. Oller, Jr., A. C. Shelley.

Smith, W. W., Engr., E. R. Heilinger Co., Tulsa. References: George Gould, G. A. McCune, R. E. Pauling, B. F. Purifoy.

Oregon

Nelson, B. A., Engr., Pacific Pumping Co., Portland. References: J. E. Finkbeiner, R. O. Haneberg, E. E. Kelly, K. R. Murhard.

Pennsylvania

Focke, T. B., Pres., The National Radiator Company, Johnstown, References: C. M. Baumgardner, L. N. Hunter, Marc Resek*, G. L. Tuve.

Kuehner, R. L., Research Engr., York Corp., York. References: R. D. Blum, J. R. Hertzler, R. F. Lauer, W. E. Zieber.

Lambert, Walter, Jr., Engr., The Trane Co., Pittsburgh. References: G. S. Clarke, A. F. Nass, Jr., B. E. Schmitz, N. S. Stake.

Raible, F. J., Jr., Engr., The Trane Co., Pittsburgh. References: J. L. Coleman, R. C. Firsching, A. F. Nass, Jr., B. B. Reilly.

South Carolina

Claussen, A. C., Jr., Engr., F. A. Bailey & Sons, Charleston. References: F. A. Bailey, Jr., M. R. Durlach, Jr., F. B. Herty, J. E. McMurray.

Tennessee

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Texas

†Ferrell, L. C., Territory Mgr., Lennox Furnace Co., San Antonio. References: L. H. Hornor, Jr., R. W. Kotzebue, L. N. Mathis, L. S. Pawkett.

Ford, J. G., Managing Engr., Todd-Ford, Ltd., San Antonio. References: Boone Benham, Jr., L. H. Hornor, Jr., L. S. Pawkett, G. R. Rhine.

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Kistenmacher, J. F., Jr., Vice Pres., J. S. Brown-E. F. Olds Plumbing & Heating Corp., Dallas. References: T. H. Anspacher, M. W. Brown, H. M. Cunningham, A. P. Flannes.

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Washington

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Sandhofer, L. J., Br. Mgr., Armstrong Cork Co., Spokane. References: J. E. Hutsinpiller, L. E. Marque, Jack Morris*, Max Tonn.

Wakefield, J. E., Owner, Wakefield Supply Co., Spokane. References: G. M. Dieter, J. A. Doyle, L. E. Harris, L. E. Marque.

Wisconsin

Loebel, B. H., Pres., Anderson & Loebel, Inc., Milwaukee. References: R. P. Bon, Bert Fredericksen, J. A. Lofte, F. T. Villelli.

Canada

Adamson, W. D., Engr., Minneapolis-Honeywell Regulator Co., Ltd., Montreal, Que. References: Roland Carrigan, J. H. Fox, G. A. Lenieux, D. L. Lindsay.

Anderson, Donald, Design-Draftsman, H. G. Acres & Co., Ltd., Niagara Falls, Ont. References: S. W. Andrews*, W. P. London*, W. M. Newby*, G. E. Smith.

Barr, F. E., Dir. of Works, Army Engrs., Ottawa, Ont. References: J. G. Baird*, A. E. Berry*, J. Heffernan*, C. Stockman*.

Bratty, L. G., Dist. Engr., Canadian Johns-Manville Co., Montreal, Que., References: O. C. Connolly, R. J. Hipkin. S. G. McDermot*, E. W. Twizell.

Eddington, H. D., Mfr's. Repr., Dominion Bridge Co., Ltd., Toronto, Ont., References: M. C. Bailey, Ernest Fox, F. D. Ledgett, L. H. Westwood*.

Emaille, Michel, Asst. Mgr., Trane Co. of Canada, Ltd., Quebec, Que., References: Oscar Dorval, H. R. Grittani, Guy Montpetit, E. C. Phillips.

Goddard, F. H., Dir., Jenkinson & Co., Ltd., Toronto, Ont., References: M. C. Bailey, Ernest Fox, G. H. Hopper, V. J. Jenkinson.

Hoyle, J. L., Head, Engrg. Div., Taylor-Forbes, Ltd., Montreal, Que., References: W. J. Blackhall, G. H. Hopper, B. J. Horsburgh, A. F. Lamontagne.

Leithead, F. A., Piping Engr., Canadian Vickers, Ltd., Montreal, Que., References: Robert Clapperton, J. P. Fitzsimons, W. G. Hole, B. J. Horsburgh.

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Lamontagne, T. M. Moran*, G. B. Rutherford*.

McAdam, W. J., Partner, Wood, McAdam & Magor, Westmount, Que., References: J. R. Dupuis, J. P. Fitzsimons, B. J. Horsburgh, F. A. Sheppard.

Monteath, G. G., Mech. Engr., Margison, Babcock & Assocs., Ltd., Ottawa, Ont. References: R. A. C. Ching*, E. J. Cunningham*, T. H. Freer*, G. S. McKernan.

Morris, C. B., Sales Engr., Standard Sanitary & Dominion Radiator, Ltd., Montreal, Que. References: B. J. Horsburgh, A. F. Lamontagne, J. A. Morris, R. A. Standring.

Naismith, James, Engr., Weather Systems, Ltd., Toronto, Ont. References: Frank Alton, Alfred Brittain, Jr., A. M. Clark, D. P. Giffen.

O'Conner, Herbert, Repr., B. F. Sturtevant Co. of Canada, Montreal, Que. References: T. E. Cockman, J. P. Fitzsimons, Paul Thibault, J. A. Tremblay.

Paquet, Maurice, Professional Engr., Leblanc, Montpetit et Dorval, Quebec, Que. References: Oscar Dorval, Guy Montpetit, J. M. Paquet, Y. R. Tasse.

Schoales, R. D. Archt., London Board of Education, London, Ont. References: Nicholas Fodor, J. H. Fox, K. B. Martin, A. C. Simpkins.

Simmonds, A. G., Draftsman, Margison, Babcock & Assocs., Ltd., Toronto, Ont. References: G. B. Bennett, E. M. Montieth*, J. A. Norton, Cord Thoms*.

Stokes, W. J., Repr., Minneapolis-Honeywell Regulator Co., Ltd., Montreal, Que. References: R. J. Bilodeau, H. B. Cooper, G. A. Lemieux, Jacob Lewin.

Tait, L. J., Repr., B. F. Sturtevant Co. of Canada, Montreal, Ont., References: T. E. Cockman, J. P. Fitzsimons, R. W. Hole, R. E. J. Layton.

Iceland

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Students

PURDUE UNIVERSITY, Lafayette, Ind.
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ACRI CONFERENCE SPEAKER

The *Air Conditioning and Refrigeration Institute's* Educational Conference at Long Beach, Calif., Saturday, March 13, had A. J. Hess, president, Hess-Greiner & Polland, Los Angeles, Calif., as principal speaker. Mr. Hess, an active member of ASHVE in his speech, *New Horizons*, traced the development of air conditioning and refrigeration, and outlined new frontiers for expansion. Mr. Hess believes that greenhouses and large plant growing research laboratories need air conditioning, and also that it can be well applied to animal husbandry. He pointed out that poultry, dairy animals, and hogs do much better with proper air conditioning.

Mr. Hess stated a duty of the profession was to conquer air pollution and conduct research on water conservation. He is of the opinion that the development of nuclear energy will *increase our scope, and . . . ultimately reduce the cost of power.*

GAMA ANNUAL MEETING

The 19th annual meeting of the *Gas Appliance Manufacturers Association* will be held at the Drake Hotel, Chicago, May 19-21.

Keyed to the theme, *Programmed Action for Profit*, the meeting will feature three general sessions, two meetings of the board of directors, the annual convention dinner, and the President's dinner.

CONSULTING FIRM MOVES

In a cleverly designed and well-worded announcement, J. Donald Kroeker and Associates, consulting engineers of Portland, Ore., list a new address, 4504 SW Corbett Ave., Portland 1, Ore.

Mr. Kroeker admitted that after 17 years tenure in Portland's Failing Building, *it was rough to pull up stakes and break up old ties.* The parting was lightened, however, by having the new home planned to exactly fit company operating procedures.

PERSONALS

T. L. Arnold, past president of the Connecticut Chapter of ASHVE, was recently appointed sales manager of the Heating Division of Fedders-Quigan Corp. He was previously sales manager of the Heating Division of the Bush Manufacturing Co. Mr. Arnold's new headquarters will be in Trenton, N.J. . . . . . . H. C. Hoffman, for the past two years manager of the Machinery and Systems Division, Carrier Corp., Dallas, Tex., has been appointed executive assistant to C. V. Fenn, vice president and general sales manager of the Division. Mr. Hoffman will make his headquarters in Syracuse. He will be succeeded by O. H. Mehl, who has been branch manager of the Houston office the last two years. Mr. Mehl is well known in the Dallas area, having been a resident of that city from 1936 to 1952. . . . . Murray Lieblich, vice president of H. Lieblich & Co., Inc., New York, N. Y., announces the company's appointment as exclusive servicing agents in the metropolitan area for the Robot Eye and Ace Instrument power plant automatic combustion control systems. . . . . A. J. Nesbitt, a member of ASHVE since 1921, and a nationally known air conditioning company executive, was elected president of Community Chests and Councils of America, Inc., during the groups' recent biennial conference in St. Louis. . . . . R. M. Rosebrough, a Life Member of ASHVE, was honored recently for completion of more than 40 years service in the heating and ventilating field. He has represented the Mueller Climatrol heating and cooling firm of Milwaukee for over four decades as sales representative and central district sales manager. His territory was St. Louis and St. Charles Counties in Missouri. . . . . M. J. Wilson, sales engineer in the Atlanta district office of Carrier Corp., has joined the Syracuse home office as a product specialist. During the nine years Mr. Wilson has been in Atlanta he has prepared and delivered many technical papers on air conditioning. He is an active member of ASHVE.

IN MEMORIAM

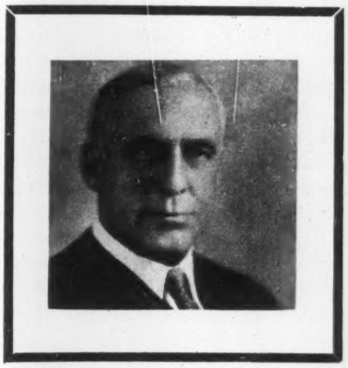
E. HOLT GURNEY

1882-1954

MEMBERS OF THE Society will be saddened to learn of the passing, Friday, March 19, of one of its distinguished past presidents, E. Holt Gurney, an engineer and industrialist of Canada.

Mr. Gurney, the first Canadian to become president of ASHVE, joined the Society in 1929, and was an intensely interested member. He was active on Council from 1931 to 1935, and again in 1939. He was known to all members of the Society for his vigorous service on numerous important committees. From 1932 to 1934, he was a member of the Executive Committee, in 1933, the Membership Committee, and in 1935 was chairman of the Finance Committee and in 1936 a member of that committee.

Mr. Gurney was second vice president in 1936, first vice president a year later, and in 1938, became the Society's president. His administration was an aggressive one, marked by expansion of Society endeavors and increase in membership. When his term of office was ended he did not relinquish his enthusiasm, and for 1939, took over the chairmanship of the Advisory Council.



He was instrumental in the adoption of resolutions to improve procedures for election of officers and was on the Committee to Study Methods of Selecting Society Officers and Council Members. From 1937 to 1941 he was a member of the F. Paul Anderson Award Committee, and in 1942, an earnest worker on the War Service Committee. Three years later, he actively participated as a member of the Committee on Research Fund Raising. He never refused to undertake a task that would benefit the Society, and he, accompanied by Mrs. Gurney, was faithful in attending Annual and Semi-Annual Meetings.

Mr. Gurney was born in Toronto, Ont., Canada, in 1882, and received his elementary and preparatory education in that city. He was a graduate of the University of Toronto. During World War I he was director of the Imperial Munitions Board. He was vice chairman of the Ontario Research Foundation, a member of the Council of the *Royal Canadian Institute* and the *Institute of International Affairs.* He was associate director of the Canadian National Exposition, and a former director of the *Canadian Institute of Plumbing and Heating.*

The University of Western Ontario, London, Ontario, doubly honored Mr. Gurney on June 4, 1949. He was selected to make the convocation speech before the graduating class of 900 students, and was given an honorary LL.D. Presentation of the degree was made by Arthur Ford, Chancellor of the University.

Funeral services were held Monday afternoon, March 22, at 2:00 p.m. and interment was in Toronto. He is survived by his wife, Nora Sutherland Gurney, and three daughters, Mrs. Peter Smellie of Ottawa; Mrs. Carr Hatch and Miss Betty Gurney of Toronto, to whom the Society Officers and Council extend their sincere sympathy.

JOURNAL SECTION

OBITUARIES

CHARLES R. CAMPION
Staten Island, N.Y.

The Society was sorry to learn of the passing of Charles R. Campion on February 10, 1954. Mr. Campion was a Society member since 1944.

Born on March 3, 1905 at Brooklyn, N.Y., Mr. Campion spent his entire life in the New York City area. In 1926 he joined the DeBothezat Impeller Co. of New York as a sales engineer, where he remained until 1931. At this time he became associated with the Garden City Fan Co., as a sales engineer, and later joined Gene Meenan, Inc., distributors of air conditioning equipment, also as sales engineer. He returned to the Garden City Fan Co. in 1936 for one year. In 1937 he and W. T. Wrightson formed a partnership, Wrightson & Campion, sales engineering representatives for Young Radiator Co.

Mr. Campion is survived by his widow, to whom the Officers and Council of the Society extend their deep sympathy.

BATES E. LANDES
Des Moines, Ia.

Bates E. Landes, consulting engineer from Iowa, died suddenly at his home in Des Moines on February 26, 1954. Mr. Landes was a member of the Society since 1938.

He was born in Keosauqua, Ia., on May 15, 1895 and he attended Iowa State College, graduating with a B.S. in mechanical engineering in 1918. Following graduation he served on the faculty of Iowa State College for one year as an instructor in mechanical engineering.

From 1919 to 1924 he was assistant mechanical engineer with the architectural firm of Proudfoot, Bird & Rawson, Des Moines. He became a registered professional engineer in the State of Iowa in 1924, and entered private consulting practice later that year.

A member of the Society's Iowa Chapter, he served as its president in 1945-46. He was also a member of the Des Moines Engineers Club.

WILLIAM D. MARSHALL
Arlington, Va.

It is with deep regret that the Society announces the death of William D. Marshall.

Mr. Marshall was born on June 19, 1898 at Hiddenite, N.C. He began his career in 1917 as a steamfitter with B. F. Shaw Co. of Wilmington, Del., and from 1918-1919 he was with N. G. Cornell Co. of Norfolk. Between 1919 and 1920 he was a salesman with the Seaboard Supply Co., Norfolk, and warehouse manager for Standard Sanitary Mfg. Co., Milwaukee, Wis. Mr. Marshall joined Noland Co., Inc., in 1920 as a heating supply salesman and was later made manager of the company's Heating Department in the Washington, D.C. branch. At the time of his death he was branch manager of the company's Arlington, Va., office.

CLARENCE T. SLUDER
Washington, D.C.

The Society announces with regret the passing of one of its members, Clarence T. Sluder.

Mr. Sluder was born on June 16, 1901 at Asheville, N.C., and he attended Georgia Institute of Technology, graduating in 1928 with a B.S. in civil engineering. In 1921 Mr. Sluder joined Sluder Brothers of Asheville, serving as an estimator. He remained with this firm until 1924 at which time he returned to college to obtain his degree. He was associated with J. B. McCrary Co., Atlanta, Ga., as an assistant engineer from 1928-1930. He returned to Sluder Brothers in 1931 as assistant manager and in 1933 entered Asheville Law University, graduating in 1937. At this time he resumed his association with Sluder Brothers and became assistant manager. This was followed by a year as manager of the Plumbing and Heating Department of Montgomery Ward. Mr. Sluder was affiliated with the Federal Housing Administration from 1942 to 1951, at which time he joined the Housing & Home Finance Agency of Washington, D.C.

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***Member of Committee on Research.**

ASHVE — OFFICERS OF CHAPTERS AND BRANCHES

(56 Chapters; 1 Special Branch; 9 Student Branches)

Date indicates year organized; an address and no city shown signifies same city as headquarters; numeral in parentheses indicates zone.

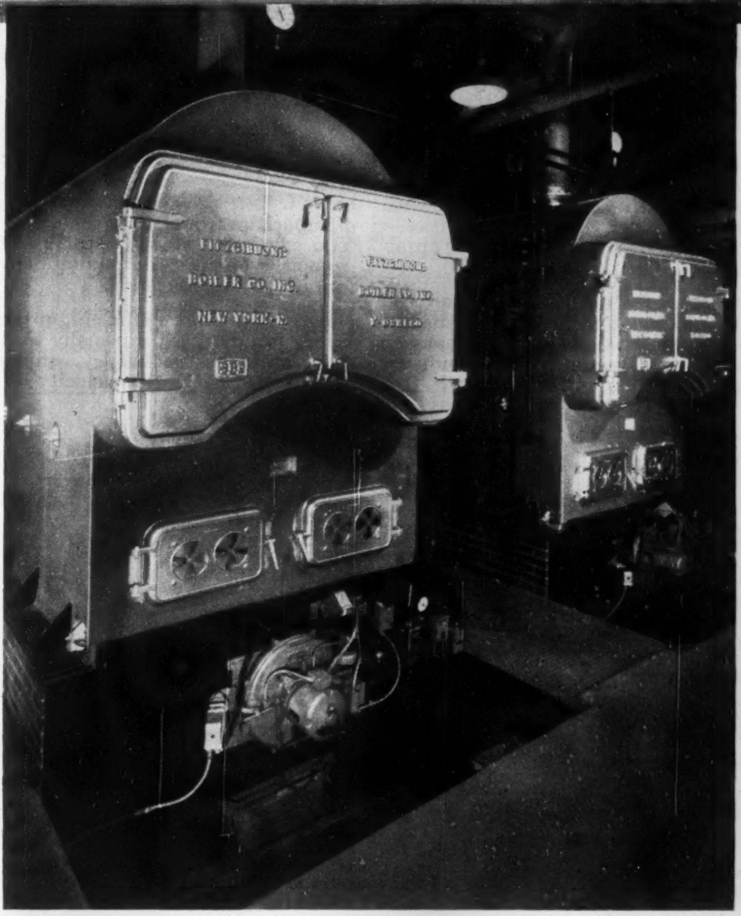
- **ARIZONA:** 1953. Hdqrs., Phoenix, Ariz. PRESIDENT, V. J. Carns, 3602 No. 15th Dr. SECRETARY, A. J. Nelesen, Jr., 6744 No. 14th Pl.
- **ARKANSAS:** 1952. Hdqrs., Little Rock, Ark. Meets, Third Tuesday. PRESIDENT, R. E. Blaylock, 509 E. Markham St. SECRETARY, J. L. Brown, 212 Terminal Warehouse Bldg.
- **ATLANTA:** 1937. Hdqrs., Atlanta, Ga. Meets, Second Monday. PRESIDENT, J. G. Croley, 400 Batavia St., East Point, Ga. SECRETARY, T. A. Barrow, 157 Simpson St., N.W.
- **BALTIMORE:** 1949. Hdqrs., Baltimore, Md. Meets, Third Wednesday. PRESIDENT, H. D. Glaser, Federal Land Bank Bldg., 2315 St. Paul St. (18). SECRETARY, G. J. Senner, 6010 Edmondson Ave. (28).
- **BRITISH COLUMBIA:** 1952. Hdqrs., Vancouver, B.C., Canada. Meets, Second Wednesday. PRESIDENT, C. W. Leek, 1155 West 49th Ave. SECRETARY, D. A. English, 6412 Adera St.
- **CENTRAL NEW YORK:** 1944. Hdqrs., Syracuse, N. Y. Meets, Fourth Wednesday. PRESIDENT, C. R. Acheson, 306 W. Genesee St. SECRETARY, H. K. Ormsby, 205 S. Townsend St. (2).
- **CENTRAL OHIO:** 1944. Hdqrs., Columbus, Ohio. Meets, Third Monday. PRESIDENT, N. T. Hess, 63 E. Goodale St. SECRETARY, R. A. Wilson, 20 S. Third St., (15).
- **CINCINNATI:** 1932. Hdqrs., Cincinnati, Ohio. Meets, First Tuesday. PRESIDENT, R. C. Beineke, 626 Broadway, (2). SECRETARY, A. H. Gerdsen, 224 E. Second St., (2).
- **CONNECTICUT:** 1940. Hdqrs., New Haven, Conn. Meets, Third Thursday. PRESIDENT, G. F. Nieske, 165 Maple St., Naugatuck. SECRETARY, E. J. Hoagland, 257 S. Whitney St., Hartford.
- **DELTA:** 1939. Hdqrs., New Orleans, La. Meets, Third Tuesday. PRESIDENT, H. L. Salaun, 317 Baronne St. SECRETARY, T. J. Jenny, 1000 S. Peters St., (9).
- **EMPIRE STATE CAPITAL:** 1951. Hdqrs., Albany, N. Y. Meets, Second Wednesday. PRESIDENT, N. W. Burrill, 33 Riverside Ave., Rensselaer. SECRETARY, L. V. Appleby, 373 State St.
- **GOLDEN GATE:** 1937. Hdqrs., San Francisco, Calif. Meets, First Thursday. PRESIDENT, J. E. Murray, 350 Mission St. (5). SECRETARY, D. E. McLeod, 105 San Pablo Ave. (27).
- **ILLINOIS:** 1906. Hdqrs., Chicago, Ill. Meets, Second Monday. PRESIDENT, H. G. Chapin, 185 N. Wabash Ave., (1). SECRETARY, H. G. Gragg, Rm. 1310, 228 N. LaSalle St. (1).
- **INDIANA:** 1943. Hdqrs., Indianapolis, Ind. Meets, Fourth Tuesday. PRESIDENT, R. C. Blackman, 5505 N. Illinois St., (8). SECRETARY, J. W. Jackson, 3514 N. Drexel, (18).
- **INLAND EMPIRE:** 1950. Hdqrs., Spokane, Wash. Meets, First Friday after First Tuesday. PRESIDENT, G. M. Dieter, 917 W. Mallon. SECRETARY, F. W. Jenkinson, N. 1904 Smith St., (15).
- **IOWA:** 1940. Hdqrs., Des Moines, Ia. Meets, Second Tuesday. PRESIDENT, J. F. Sandfort, Iowa State College, Ames. SECRETARY, G. J. Kraai, 907 Sixth Ave. (14).
- **KANSAS:** 1951. Hdqrs., Wichita, Kan. Meets, Tuesday after First Monday. PRESIDENT, R. L. Pennington, 520 So. Commerce (2). SECRETARY, O. B. Strahm, 601 So. Terrace Dr.
- **KANSAS CITY:** 1917. Hdqrs., Kansas City, Mo. Meets, First Monday. PRESIDENT, G. H. Stoffer, 200 Riss Building (6). SECRETARY, A. S. Hurt, Jr., 2119 Washington St., (8).
- **MANITOBA:** 1935. Hdqrs., Winnipeg, Man., Canada. Meets, Fourth Thursday. PRESIDENT, A. K. Piercy, 222 Osborne St. N. SECRETARY, D. B. Brace, 1550 Dublin Ave.
- **MASSACHUSETTS:** 1912. Hdqrs., Boston, Mass. Meets, Third Tuesday. PRESIDENT, A. L. Hare, 127 Federal St. (10). SECRETARY, W. G. Martin, Jr., 20 Winchester St. (16).
- **MEMPHIS:** 1944. Hdqrs., Memphis, Tenn. Meets, Third Monday. PRESIDENT, A. W. Shelby, 972 Union Ave. SECRETARY, A. T. Bevil, 1638 Union Ave. (4).
- **MIAMI VALLEY:** 1950 Hdqrs., Dayton, Ohio. Meets, First Wednesday. PRESIDENT John Schweiger, 593 Acorn Drive, (9). SECRETARY, D. E. Tullis, 743 Kiser St. (4).
- **MICHIGAN:** 1916. Hdqrs., Detroit, Mich. Meets, First Monday after 10th of month. PRESIDENT, R. H. Oberschulte, 316 McKerchey Building, (1). SECRETARY, D. S. Falk, 4864 Woodward Ave. (1).
- **MINNESOTA:** 1918. Hdqrs., Minneapolis, Minn. Meets, First Monday. PRESIDENT, V. E. Pearson, 739 Marquette Ave. (2). SECRETARY, E. T. Erickson, 500 Baker Arcade.
- **MISSISSIPPI:** 1953. Hdqrs., Jackson, Miss. PRESIDENT, I. E. Rowe, 120 Georgia St. SECRETARY, M. E. Price, 205 Arbor Hill Dr.
- **MONTREAL:** 1936. Hdqrs., Montreal, Que., Canada. Meets, Third Monday. PRESIDENT, D. L. Lindsay, 4350 Sherbrooke St. (6). SECRETARY, S. R. Plamondon, 1570 St. Hubert St. (14).
- **NEBRASKA:** 1940. Hdqrs., Omaha, Neb. Meets, Second Tuesday. PRESIDENT, O. J. Smith, 233 Grain Exchange Bldg., (2). SECRETARY, S. W. Black, 18th & Harney Sts.
- **NEW YORK:** 1911. Hdqrs., New York, N. Y. Meets, Third Monday. PRESIDENT, J. E. Schechter, 32-08 38th Ave., Long Island City (1). SECRETARY, Carl H. Flink, 62 Worth St. (13).
- **NORTH JERSEY:** 1952. Hdqrs., Newark, N. J. Meets, Second Tuesday. PRESIDENT, H. M. Patrick, 20 Olcott Ave., Bernardsville. SECRETARY, W. C. Kruse, Jr., 40 E. Park St. (2).
- **NORTH TEXAS:** 1938. Hdqrs., Dallas, Tex. Meets, Third Monday. PRESIDENT, M. W. Brown, 1213 Texas Bank Bldg. SECRETARY, H. G. Gregerson, 2921 Fairmount.
- **NORTHEASTERN OKLAHOMA:** 1948. Hdqrs., Tulsa, Okla. Meets, Second Tuesday. PRESIDENT, R. W. Winget, 2428 E. 11th St., Box 100. SECRETARY, J. T. McKinney, 1341 So. Boston.
- **NORTHERN OHIO:** 1916. Hdqrs. Cleveland, Ohio. Meets, Second Monday. PRESIDENT, J. M. Black, 1296 Gordon Rd., Lyndhurst. SECRETARY, Sherwood Nassau, 6014 Euclid Ave.
- **NORTHERN PIEDMONT:** 1952. Hdqrs., Greensboro, N.C. Meets, Second or Third Friday. PRESIDENT, R. B. Crosland, Jr., 1001 S. Marshall St., Winston-Salem. SECRETARY, W. H. Cooper, 1001 S. Marshall St., Winston-Salem.
- **OKLAHOMA:** 1935. Hdqrs., Oklahoma City, Okla. Meets, Second Monday. PRESIDENT, F. X. Loeffler, Jr., Box 529. SECRETARY, G. E. Ervin, 2800 N. Oklahoma St. (5).
- **ONTARIO:** 1922. Hdqrs., Toronto, Ont., Canada. Meets, First Monday. PRESIDENT, N. W. Kingsland, 31 Willcocks St. SECRETARY, H. R. Roth, 57 Bloor St., W.
- **OREGON:** 1939. Hdqrs., Portland, Ore. Meets, Thursday after First Tuesday. PRESIDENT, A. N. Hoss, 621 S.W. Alder (5). SECRETARY, J. E. Finkbeiner, 10260 S.W. Daphne Pl (1).
- **OTTAWA VALLEY:** 1952. Hdqrs., Ottawa, Ont., Canada. Meets, Third Tuesday. PRESIDENT, G. L. Ostiguy, 282 Westhill Ave. (3). SECRETARY, N. J. Howes, Box 264, R. R. 1.
- **PACIFIC NORTHWEST:** 1928. Hdqrs., Seattle, Wash. Meets, Second Tuesday. PRESIDENT, H. T. Orebaugh, 1330 Dearborn. SECRETARY, L. F. Christofferson, 7358-58th Ave. N.E., (5).
- **PHILADELPHIA:** 1916. Hdqrs., Philadelphia, Pa. Meets, Second Thursday. PRESIDENT, L. M. Church, 12 So. 12th St. (7). SECRETARY, C. J. Forve, Parkwood Manor, Apt. B-202, State Rd. & Penarth Ave., Upper Darby.
- **PITTSBURGH:** 1919. Hdqrs.. Pittsburgh, Pa. Meets, Third Monday. PRESIDENT, C. H. Schneider, 310 Washington Rd. SECRETARY, E H. Riesmeyer, Jr., 231-33 Water St. (22).
- **ROCKY MOUNTAIN:** 1944. Hdqrs., Denver, Colo. Meets, First Wednesday. PRESIDENT, H. L. Wray, 1101 Geneva St., Aurora. SECRETARY, J. F. Cipra, Jr., 2676 S. Madison St.
- **SACRAMENTO VALLEY:** 1952. Hdqrs., Sacramento, Calif. Meets, First Wednesday. PRESIDENT, E. C. McKinsey, 4220 Annette (21). SECRETARY, R. A. Sarro, 5412 Argo Way.
- **ST. LOUIS:** 1918. Hdqrs., St. Louis, Mo. Meets, Second Tuesday. PRESIDENT, H. C. Sharp, 4060 W. Pine Blvd. (8). SECRETARY, W. P. Norris, 1118 Fullerton Bldg.
- **SHREVEPORT:** 1948. Hdqrs., Shreveport, La. Meets, Third Thursday. PRESIDENT, M. A. Hudson, 753 Gladstone Blvd. SECRETARY, R. S. Segall, 603 Cotton St.
- **SOUTH CAROLINA:** 1954. Hdqrs., Columbia, S. C. PRESIDENT, R. F. Donovan, 401 Wildwood. SECRETARY, J. E. McMurray, 1639 Blanding St.
- **SOUTH TEXAS:** 1938. Hdqrs., Houston, Tex. Meets, Third Friday. PRESIDENT, E. G. Floeter, Jr., P.O. Box 1657 (1). SECRETARY, F. M. Neil, 3513 W. Dallas Ave. (19).
- **SOUTHERN CALIFORNIA:** 1930. Hdqrs., Los Angeles, Calif. Meets, First Tuesday. PRESIDENT, L. B. Davenport, 137 S. Anderson St. (33). SECRETARY, J. L. McCullough, 1978 S. Los Angeles St. (11).
- **SOUTHERN PIEDMONT:** 1952. Hdqrs., Charlotte, N.C. PRESIDENT, R. S. Fullerton, P.O. Box 3697. SECRETARY, J. R. Clark, P.O. Box 1755.
- **SOUTHWEST TEXAS:** 1946. Hdqrs., San Antonio, Tex. Meets, Third Tuesday. PRESIDENT, L. H. Hornor, Jr., 816 Insurance Bldg. SECRETARY, Boone Crisp, P.O. Box 9065, (4).
- **UTAH:** 1944. Hdqrs., Salt Lake City, Utah. Meets, Third Thursday. PRESIDENT, M. L. Gollaher, 1163 Roosevelt Ave. (5). SECRETARY, G. L. Soderborg, Sr., 42 E. 8th St. S.
- **VIRGINIA:** 1946. Hdqrs., Norfolk, Va. Meets, Third Wednesday. PRESIDENT, H. E. Marquart, 111 W. Main St. SECRETARY, R. L. Burton, Jr., 1913 Lafayette Blvd.
- **WASHINGTON, D. C.:** 1935. Hdqrs., Washington, D. C. Meets, Second Wednesday. PRESIDENT, J. G. Muirheid, Bureau of Ships, Navy Dept. (25). SECRETARY, W. C. Reamy, Jr., 720 Mills Bldg. (6).
- **WEST TEXAS:** 1953. Hdqrs., Lubbock, Tex. PRESIDENT, L. C. McKay, 210 Sanford Bldg. SECRETARY, J. C. Wharton, Box 1240.
- **WESTERN MICHIGAN:** 1931. Hdqrs., Grand Rapids, Mich. Meets. Second Monday. PRESIDENT, J. T. Anderson Michigan State College, East Lansing. SECRETARY, N. A. Buckley, 514 Park Rd., Jackson.
- **WESTERN NEW YORK:** 1919. Hdqrs., Buffalo, N. Y. Meets, Second Monday. PRESIDENT, C. W. Stone, 1219 Main St. (9). SECRETARY, C. W. Kaupp, 271 Delaware Ave.
- **WISCONSIN:** 1922. Hdqrs., Milwaukee, Wis. Meets, Third Monday. PRESIDENT, N. E. Hill, 122 N. Hartwell Ave., Waukesha. SECRETARY, K. H. Forfar, 2711 N. 27th St. (10).

SPECIAL BRANCH

- **SWISS:** 1952. Hdqrs., Zurich, Switzerland. PRESIDENT: Walter Sennhauser, Sulzer Bros., Ltd., Winterthur. SECRETARY, Walter Hausler, Erbstrasse 2, Kusnacht, Zurich.

STUDENT BRANCHES

- **NORTH CAROLINA STATE COLLEGE:** 1948. Hdqrs., Raleigh, N. C. PRESIDENT, Norman Falbaum, Box 4668, State College Station. SECRETARY, J. L. Flowers, Apt. 33-E, Vetville.
- **OKLAHOMA A. & M. COLLEGE:** 1950. Hdqrs., Stillwater, Okla. PRESIDENT, C. E. Durrett, 1215 College. SECRETARY, R. M. Jauch, 308½ W. Maple.
- **OREGON STATE COLLEGE:** 1949. Hdqrs., Corvallis, Ore. Meets, First Wednesday after First Tuesday. PRESIDENT, R. E. Bulletset, 252 Kings Rd. SECRETARY, I. P. Parkhurst, 1354 Harrison.
- **PURDUE UNIVERSITY:** 1948. Hdqrs., W. Lafayette, Ind. CHAIRMAN, R. G. Supple, 640 Russell St. SECRETARY, R. E. Jacobs, 1534 Colfax St., Lafayette.
- **TEXAS A. & M. COLLEGE:** 1946. Hdqrs., College Station, Tex. Meets, Second and Fourth Tuesday. PRESIDENT, D. F. Carroll, Box 6264. SECRETARY, C. W. Farrar, Jr., Rt. 1, Box 339, Bryan.
- **UNIVERSITY OF DETROIT:** 1949. Hdqrs., Detroit, Mich. Meets, First Tuesday. PRESIDENT, J. R. Cairns, 4001 Florence, (21). SECRETARY, W. E. Zimmerman, 15359 Lauder (27).
- **UNIVERSITY OF KANSAS:** 1949. Hdqrs., Lawrence, Kans. Address mail to Dr. Warren E. Snyder, chairman, Dept. of Mechanical Engineering, University of Kansas.
- **UNIVERSITY OF TEXAS:** 1949. Hdqrs., Austin, Tex. Meets, First and Third Tuesday.
- **UNIVERSITY OF TORONTO:** 1951. Hdqrs., Toronto, Ont. CHAIRMAN, Alexander Tudor, 75 South Dr. SECRETARY, T. M. Devine, More House, St. Michaels College.



Above: The Physical Education Building, Albright College, Reading, Pa. Architects: Muhlenberg Brothers, Wyomissing, Pa., Consulting Engineers: Moody & Hutchison, Philadelphia, Pa., Heating Contractor: Corbit's, Inc., Reading, Pa.

At right: Boiler room of the Physical Education Building, Albright College, Reading, Pa. The two Fitzgibbons "D" Type boilers are SBI rated at 24,290 sq. ft. steam.

In a class by itself for educational buildings

FITZGIBBONS "D" TYPE STEEL BOILER has time and time again passed every test, with highest honors, in providing the comfort-warmth essential to modern education, and doing it with the economy that school boards and taxpayers applaud. The answer is Fitzgibbons design, with its complete combustion of fuel, rapid circulation of boiler water, and construction that more than meets ASME Code requirements.

Everywhere you will find schools, colleges, institutional buildings—in fact, all types of big buildings—heated by Fitzgibbons boilers. For all the reasons, and complete specifications, write Fitzgibbons Boiler Company, Inc., 101 Park Avenue, New York 17, N.Y.

SINCE 1886 MOST ECONOMICAL IN FUEL THE FITZGIBBONS BOILER 1886

The Fitzgibbons Boiler®

STEEL BOILER INSTITUTE SBI HEATING PROCESS POWER

Completely NEW Line of

Now! Wider range, exclusive new features

20 new Trane Climate Changers for any capacity, 600 to 29,000 cfm! Complete line of factory-built units for flexible application, easy installation!

Now, a brand new, more complete line of TRANE Climate Changers with an even wider range of capacities—20 new models for more flexible application.

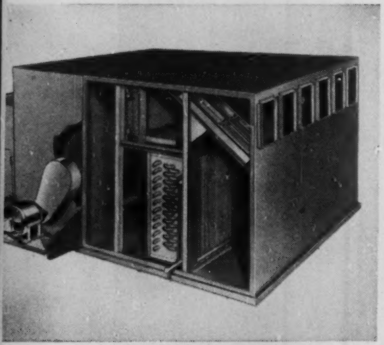
Designed for easier installation, full accessibility and less maintenance, these *new* TRANE Climate Changers are the most modern factory-built air handling units in the industry!

Wider capacity range simplifies selection. Ten sizes cover entire range of capacities from 600 to 29,000 cfm. You can select a unit with just the capacity you need for maximum system operating efficiency.

New fans are more efficient, quieter. Every fan designed especially for its unit for highest efficiency, quietest operation. Low outlet velocity—approximately 1,500 feet per minute. Climate Changers are rated by fan capacity *in the unit.*

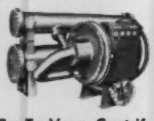
Increased design flexibility, more accessories. You get any or all of *24 practical combinations* of heating, cooling, humidification, dehumidification, ventilating and filtering. Three types of heating coils for steam or hot water—five types of cooling coils for chilled water, well water or Freon. Three types of humidifiers, three kinds of filters. Matched face-and-by-pass dampers and mixing boxes. *No other air handling unit offers such versatility!*

Installation simplified. Fan outlets, for example, are quickly reversible on job—three ways on vertical units,

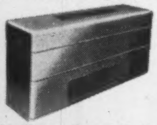


6 climates from one Climate Changer! TRANE Multi-Zone Climate Changers give individual temperature control in one to six zones. Units are quality constructed. Sectional construction if desired. 1,800 to 23,400 cfm.

A Trane Product for Every Air Conditioning Need

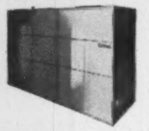


CenTraVacs, Centrifugal Water Chillers 45 to 400 ton capacity.

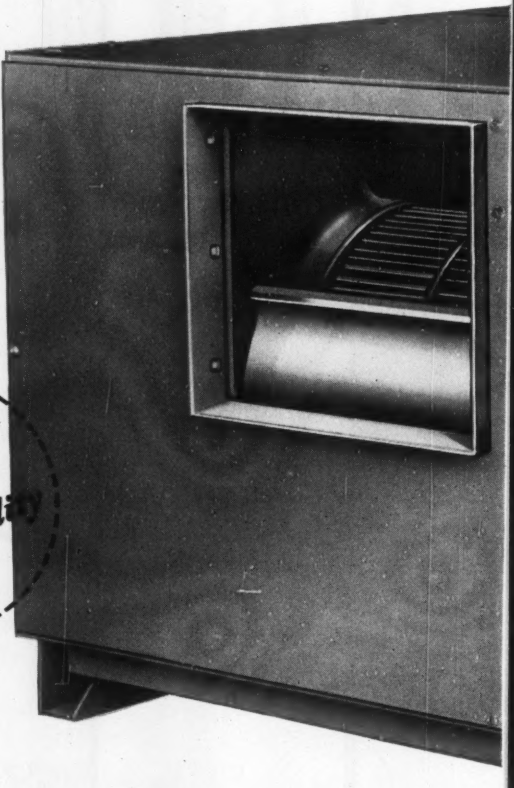


UniTrane Room Units for air conditioning multi-room buildings.

Cold Generators, packaged water chillers, 10 to 100 tons capacity.



Self-Contained Air Conditioners from 3 to 20 tons capacity.



one source • one responsibility

TRANE

Climate Changers

MANUFACTURING ENGINEERS OF AIR CONDITIONING, HEATING,
VENTILATING AND HEAT TRANSFER EQUIPMENT

The Trane Company, La Crosse, Wis. • East. Mfg. Div., Scranton, Penn.
Trane Co. of Canada, Ltd., Toronto • 90 U.S. and 14 Canadian Offices

Trane Climate Changers

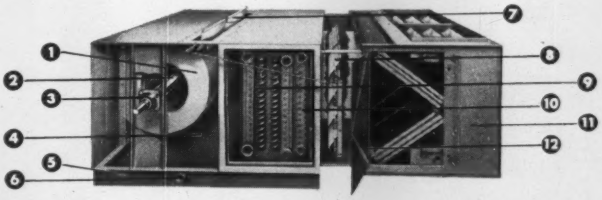
in industry's most modern air conditioner

two ways on horizontal units. Motor mount adjustable four ways. All units will clear 36″ door except sections of largest unit which will clear 40″ door.

External bearings cut maintenance time and cost. Bearings can be serviced in minutes instead of hours. All bearings are self-aligning type.

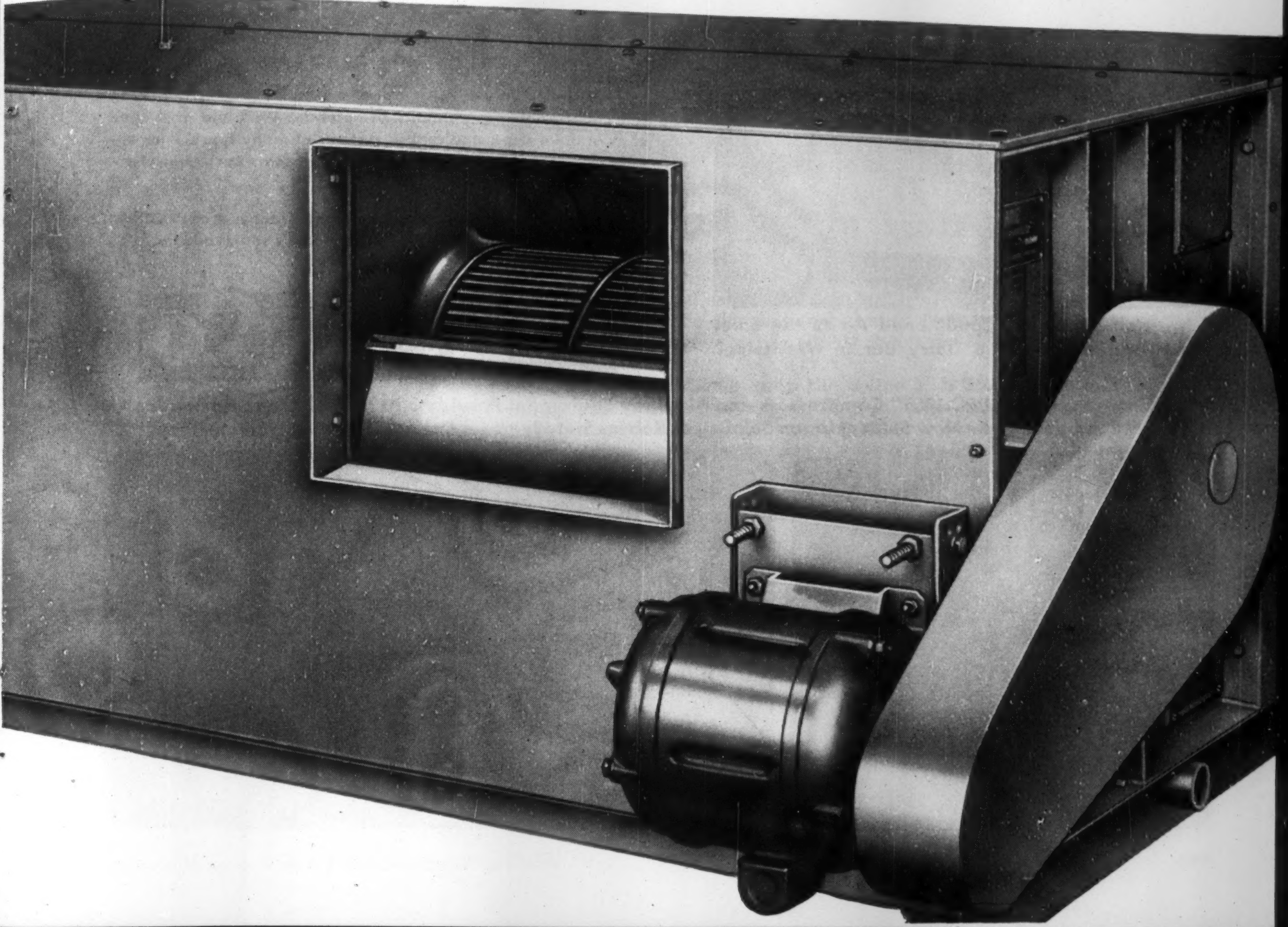
Sloping drain pan for positive drainage. Side drain connection for minimum head room. Pan under *entire* unit. From top to bottom, new TRANE Climate Changers are designed for efficiency, built for long service!

Specify TRANE Climate Changers. For complete details and roughing-in dimensions, call your TRANE Sales Office or write TRANE, La Crosse, Wis.



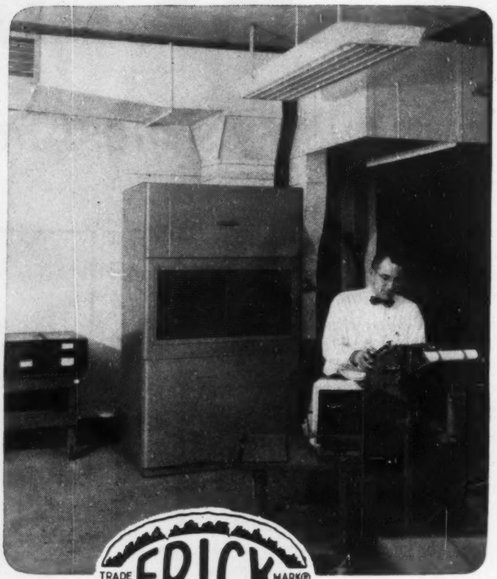
1. **Centrifugal fans** designed for unit.
2. **Fan shaft** — large diameter, solid steel.
3. **External bearings** for easier maintenance.
4. **Humidifiers** — available in three types.
5. **Sloping drain pan** — gives positive drainage.
6. **Side drain connection** — saves head room.
7. **By-pass dampers** for temperature control.
8. **Face dampers** interconnected with by-pass.
9. **Cooling coils** — water or D.E.; five types.
10. **Heating coils** — steam or hot water; three types.
11. **Mixing box** with dampers and filters.
12. **Full access** to interior of unit.

↓ **New TRANE Climate Changers** with sectional construction are designed to meet close space requirements, a wide variety of capacity needs. Horizontal models (below) can be ceiling suspended or installed on platform. Vertical models are floor mounted. Fan outlets are reversible on job . . . 3 ways on vertical units, 2 ways on horizontal. Units *deliver* the capacity you select—TRANE Climate Changers are rated by fan performance *in the unit*, from 600 to 29,000 cfm.

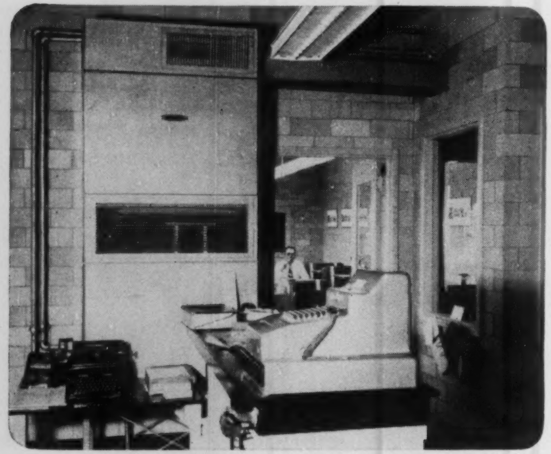


This Shoe Store Rings-up More Sales Since the 5-hp. Frick Unit Air Conditioner and Duct System Shown were Installed.

At right: One of Four Frick Unit Conditioners Serving the Bankers Trust Company at Indianapolis.



TRADE FRICK MARK®



3-hp. Unit Supplying Conditioned Air to the Sales Room and Offices of a Dairy Bar in Mississippi.

Air Conditioning Will Help Any Business (Yours Included) Add-up More Profits—

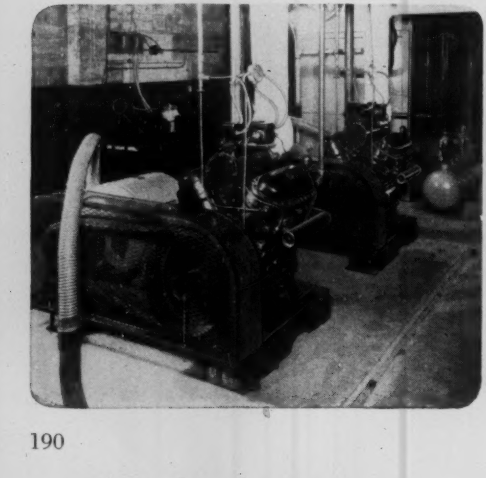
By drawing more trade, getting customers to stay longer, and keeping your staff more alert, more loyal.

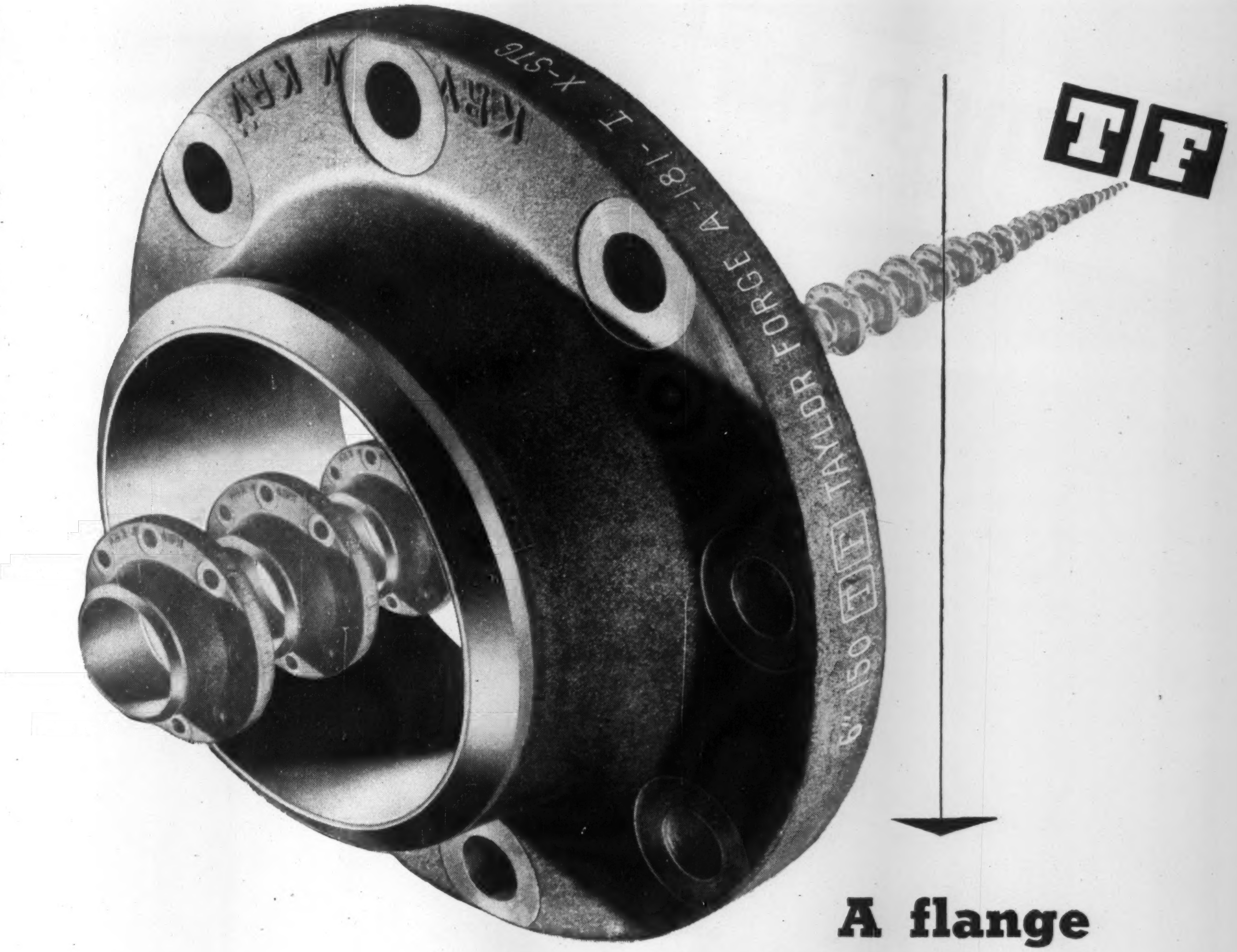
Whether you are a distributor or a user, Frick air conditioning will meet your requirements completely. We build packaged units in three sizes, and central systems of many types. Frick engineers are unbiased in recommending the exact equipment you need.

Get in touch with the nearest Frick man today. Branch Offices in principal cities: good territories for dealers still available.

DEPENDABLE REFRIGERATION SINCE 1882
FRICK CO.
WAYNESBORO, PENNA. U.S.A.

Below: Two 6-cyl. Frick "ECLIPSE" Compressors and Auxiliary Equipment Provide 120 tons of Refrigeration for Air Conditioning the New Student Union Building at Kansas State Teachers College, Pittsburg, Kansas.





A flange with a background . . .

For up-to-the-minute facts see your Taylor Forge Distributor

You are looking at a flange with a history. Taylor Forge made the forged steel flange and in a sense the forged steel flange made Taylor Forge. It was Taylor Forge, back in 1905, who made the first forged steel flanges on a commercial scale . . . and it is Taylor Forge who has guided flange development across the past half century.

Through the first threaded flange form, the bolted Van Stone form, and the perfected welding neck form pictured here, Taylor Forge has undeniably contributed more to flange development than any other organization*.

Taylor Forge Welding Neck Flanges are a part of the WeldELL® line—the line that more than 20 years ago gave industry the first complete line of fittings for pipe welding. The organization that led development is still leading . . . in scope of types, sizes, weights, materials . . . in quality and downright value!

TAYLOR FORGE

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Plants at: Carnegie, Pa., Fontana, Calif., Gary, Ind., Hamilton, Ont., Canada

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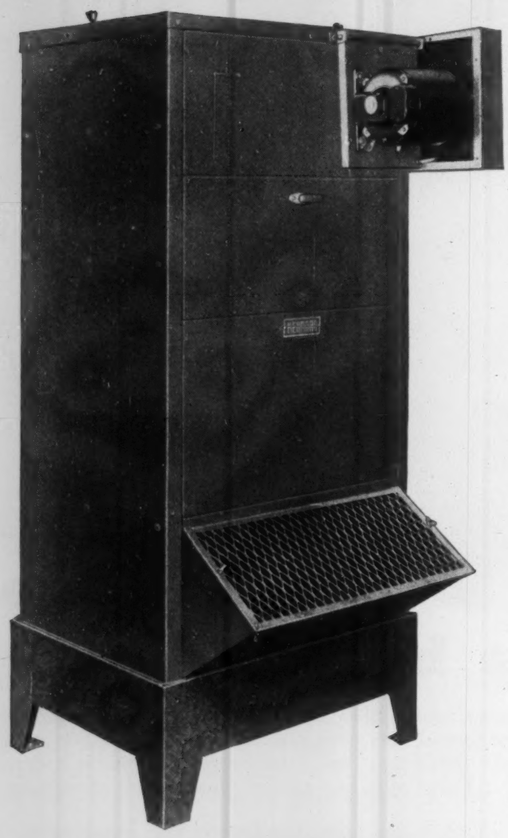
* When pressures rose from the old 150- and 300-pound standards to 400, 600 and finally 900 pounds, it was largely the exhaustive research of Taylor Forge that supplied the formulas for determining stresses in flanges for any given condition of loading. Among many examples: the Taylor-Waters formula, published in 1927, became and still is the basis of recognized practice for flanges in sizes through 24". Again, in 1938 Taylor Forge published the first edition of the now authoritative "Modern Flange Design" based on methods proposed by E. O. Waters, D. B. Rossheim, D. B. Wesstrom and F. S. G. Williams, Taylor Forge Manager of Engineering Standards. (ASME Trans., Apr. 1937)

KENNARD *Engineered*

KT WATER SAVERS



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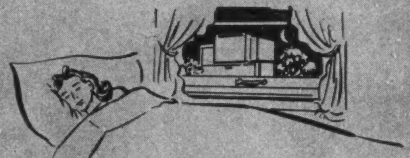
KENNARD KT Water Savers, ***"Packaged Economy Line Cooling Towers"*** are ready for you NOW! Outstanding features found in KT Water Savers—Centrifugal type fan, redwood wetted deck, galvanized construction throughout, engineered for long life — OUTDOOR or INDOOR. Sized to meet popular demand, 3, 5, 8, 11 & 16 tons. Catalog KT-2.

Complete line of Cooling Towers—20 thru 75 tons. Cat. CT-1

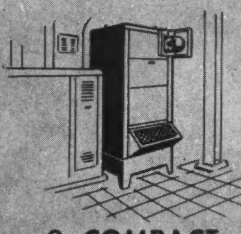
4 Reasons Why

KENNARD ENGINEERED
KT WATER SAVERS
ARE BETTER



1. QUIET

2. SAFE



3. COMPACT

4. RUGGED

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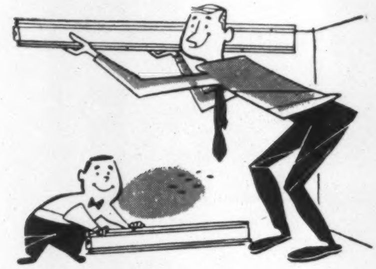
1817 S. HANLEY RD. • ST. LOUIS 17, MO.



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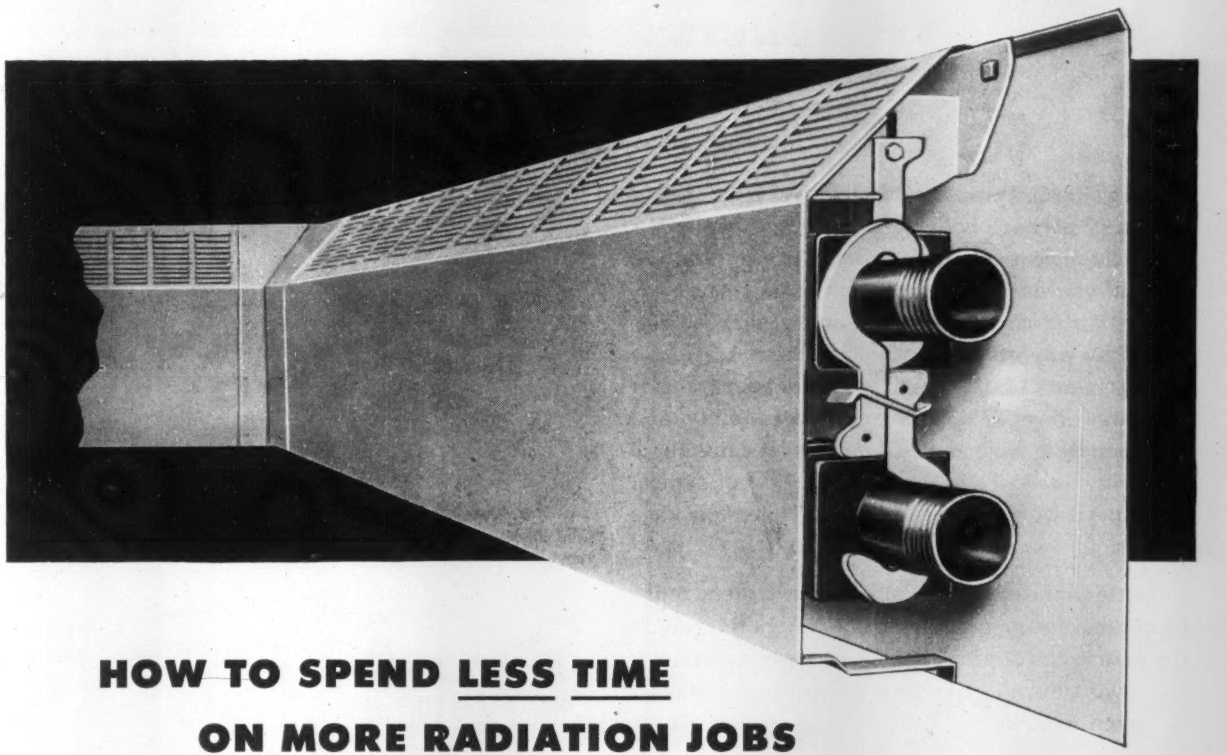
"Full line of accessories"

"Wide choice of hangers"



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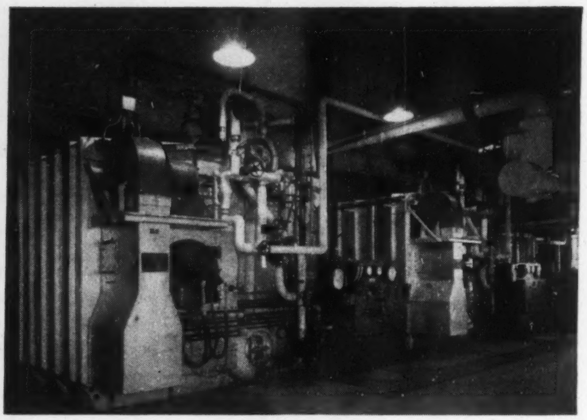
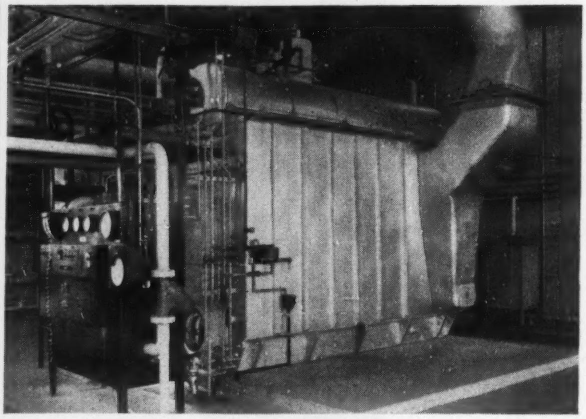
City________________Zone____State________

Why are they Buying VP Boilers?



Industrial installation in the Midwest. Two VP Boilers. Capacity—28,000 lb steam per hr each at 225 psi.



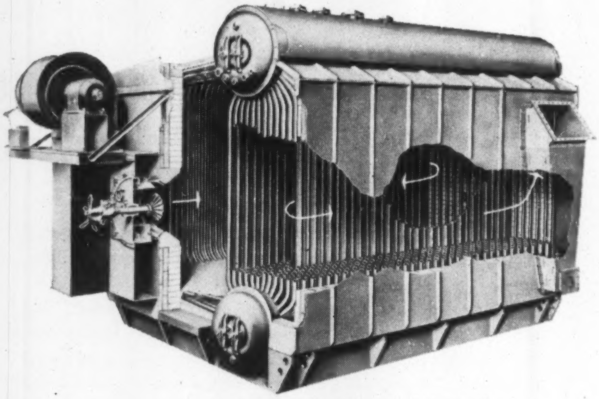
This VP Boiler serves a sewer pipe manufacturer in California. Capacity—20,000 lb steam per hr at 215 psi.

There's good reason for the fact that so many buyers of package boilers are finding that the VP offers them more for their money. For only in the VP will you find such significant *extra* features as—more water-cooling area per unit of furnace volume than any other boiler of its class . . . simple arrangement of baffles for maximum heat transfer . . . large lower drum for good accessibility and easy handling of load swings . . . quiet centrifugal fan, with less than half the noise level of typical high-speed blowers used on most other package boilers.

Little wonder then that VP purchasers range from small companies to some of the largest in the country . . . industrials of all kinds . . . schools and institutions . . . various government agencies . . . even the Atomic Energy Commission. These users are employing VP Boilers for all types of applications—heating, process, and even power generation.

Make sure then that you have details of the VP at your fingertips when next you are in the market for a boiler of moderate capacity. Ask for the new Catalog VP-184, which contains specifications and general information on dimensions, space requirements, construction details and controls.

B-748B



Specifications — VP Boiler

Capacity—4000 to 30,000 pounds of steam per hour
Pressures—Up to 500 pounds per square inch
Fuel—Oil or gas
Erection—Completely shop-assembled
Foundation—Simple concrete slab

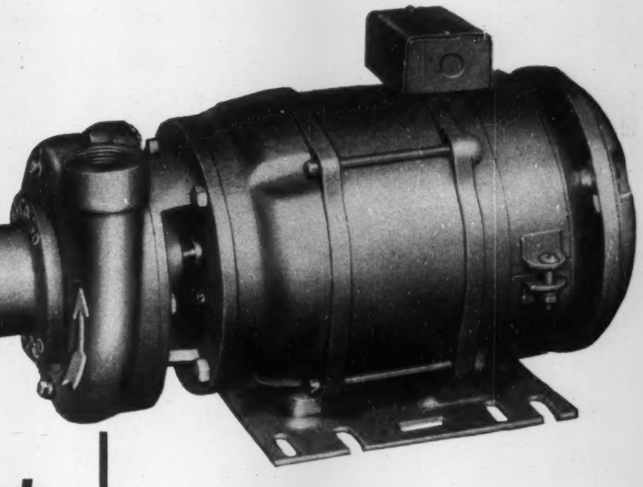
C-E

COMBUSTION ENGINEERING

Combustion Engineering Building, 200 Madison Avenue, New York 16, N. Y.

BOILERS, FUEL BURNING & RELATED EQUIPMENT; PULVERIZERS, AIR SEPARATORS & FLASH DRYING SYSTEMS; PRESSURE VESSELS; AUTOMATIC WATER HEATERS; SOIL PIPE

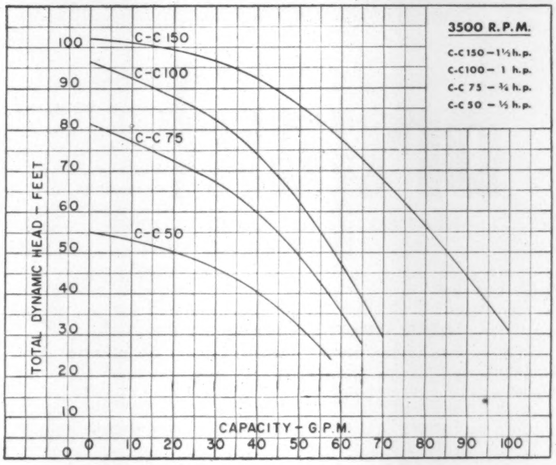
CC CLOSE-COUPLED PUMPS



All models in stock
Shipped same day order received

TYPICAL C-C SERIES PUMP APPLICATIONS ARE:

Cooling Towers • Air Conditioning
Chilled Water Circulating
Hot Water Circulating
Pneumatic Water Systems
Booster Systems



CHICAGO PUMP CO

C-C Series pumps are equipped with a Leak-Proof "Chicago Mechanical Seal". Each pump operates over the entire range of its curve quietly and smoothly without motor overload.

CHICAGO PUMP COMPANY

BUILDING and INDUSTRIAL DIVISION

622 DIVERSEY PARKWAY
CHICAGO 14, ILLINOIS

Condo-Vac, Sure Return. AVC, LVC,
Fire, House & Circulating Pumps
Pneumatic & Tankless Water Systems.

Flush-Kleen Sewage Ejectors
Little Giant & Non-Clog Bilge Pumps
Pumps for every industrial use.

is something

ALWAYS

missing?

(to cut your profit)

...then switch to the one line that meets every selling need

***EXAMPLE No. 3:** Your own experience will tell you that it's usually easier to sell an established name. This is a premium advantage you enjoy when you offer Bryant. First, because Bryant—in 45 years in business—has earned a reputation for quality in millions of American homes. Second, because Bryant—over this same span of years—has consistently advertised nationally and locally to support *your* selling efforts—*longer than any other manufacturer of automatic heating, air conditioning and water heating equipment!*

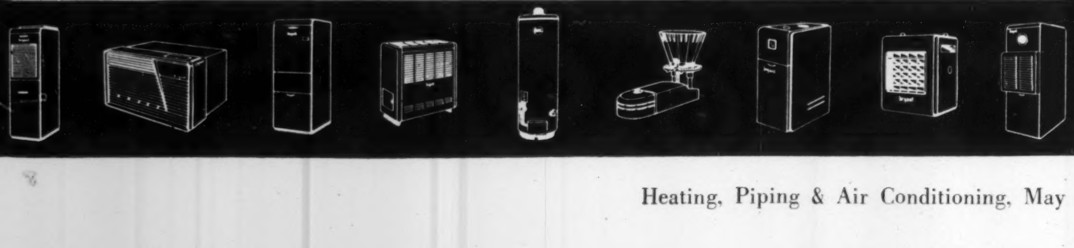
Your nearby Bryant Distributor has complete details. It will pay you to call him today.

bryant®

HEATING AIR CONDITIONING WATER HEATING

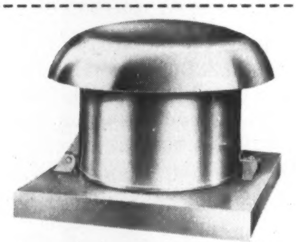
1. The most complete line in the industry
2. Quality products—Competitively priced
3. *Established name—Good customer acceptance
4. Broad, attractive profit margins
5. Local Distributor warehousing and service
6. Factory district representatives and traveling sales training and service teams

Bryant Heater Div., Affiliated Gas Equipment, Inc., 17825 St. Clair Ave., Cleveland 10, Ohio



GYRA-FLO ROOF EXHAUSTERS

Engineered for extremely quiet operation in schools, institutions, churches, etc.—wherever roof ventilation is practical. Air capacities: 830 to 29,750 CFM—Static pressure: 1/8" to 3/4". Bulletin GPE-103.



AXIAL MUSHROOM EXHAUSTERS

Designed for rugged industrial or commercial applications where an extremely low operating noise level is less important. Air capacities: 870 to 47,800 CFM—Static pressure: up to 1½". Blade diameters: 14" to 48". Bulletin CAM-102.

CHICAGO

POWER ROOF EXHAUSTERS

So *silent*, they're practically *unheard*—so compactly designed, they're almost *unseen*—so engineered, they can be depended on to move air in measured volume according to accurate, certified ratings. Operating costs are low—with maintenance at a minimum.

It pays to use "Chicago" Power Roof Exhausters for dependable ventilation in institutions and industry. "Chicago" Power Roof Exhausters pay their way in safeguarding health and in creating a better atmosphere in which to live, work, study, or play. They assure *quieter* ventilation with long range economy. There's a type and size for every requirement.

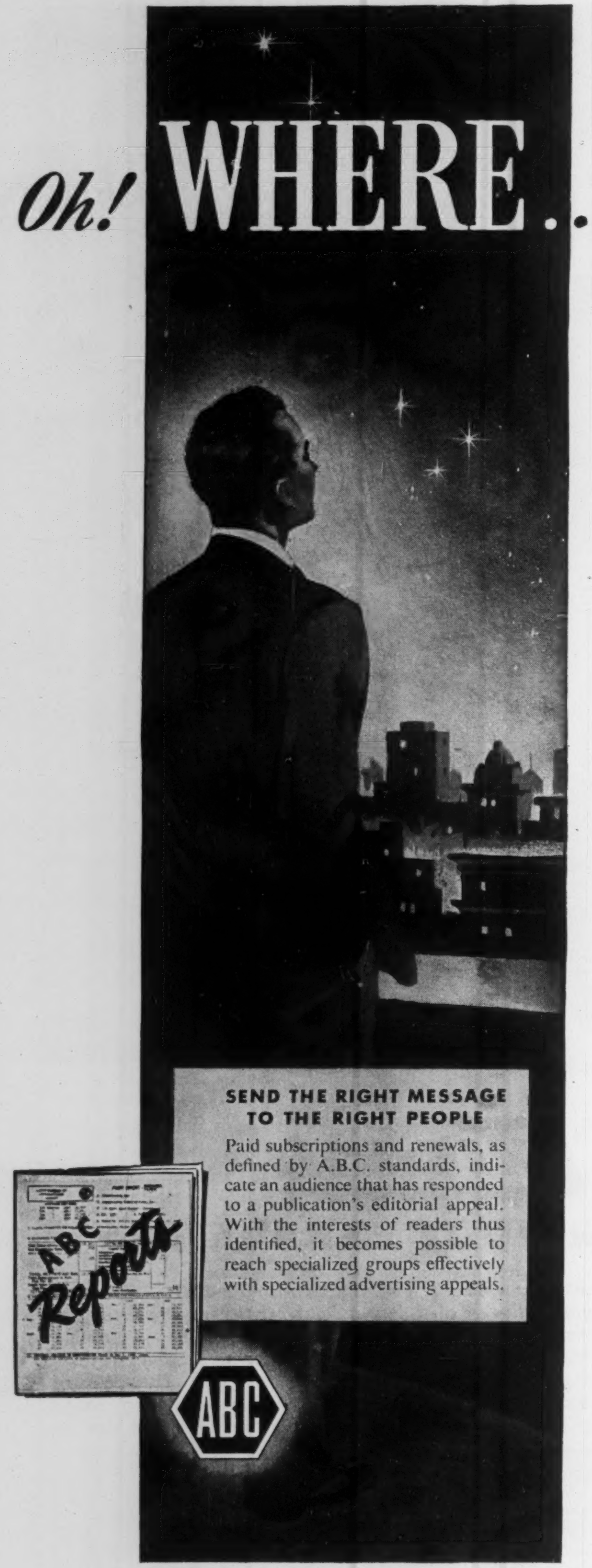
Write for FREE Detailed Bulletins Today!

See your local classified directory under "Fans-Blowers" for your nearest "Chicago" Engineer

CHICAGO BLOWER CORPORATION

9867-HP5 Pacific Ave., Franklin Park, Ill. GLadstone 5-4780

Oh! WHERE*. . . is my wandering ad tonight?*



SEND THE RIGHT MESSAGE TO THE RIGHT PEOPLE

Paid subscriptions and renewals, as defined by A.B.C. standards, indicate an audience that has responded to a publication's editorial appeal. With the interests of readers thus identified, it becomes possible to reach specialized groups effectively with specialized advertising appeals.

THERE are two ways to buy advertising space. One is the guesswork-opinion method. The caption above is the mournful song of an advertiser who is still selecting media the way it was done before World War I, when there were no standards for the circulations of published media and when there was no accepted and approved method of auditing circulations. In those days, advertisers O.K.'d their proofs and sent out their advertising with a prayer that some of their sales messages would find their way to market.

The other way to buy space is the factual, know-what-you-get-for-your-money method. Today advertisers can start their investments on a basis of facts by selecting media with the help of the information in the reports issued by the AUDIT BUREAU OF CIRCULATIONS. This cooperative and nonprofit association of 3300 advertisers, advertising agencies and publishers, organized in 1914, has established standards that make it possible to evaluate the circulations of published media. The A.B.C. maintains a large staff of experienced and specially trained circulation auditors who make annual audits of the circulations of publisher members. A.B.C. reports give the facts thus obtained.

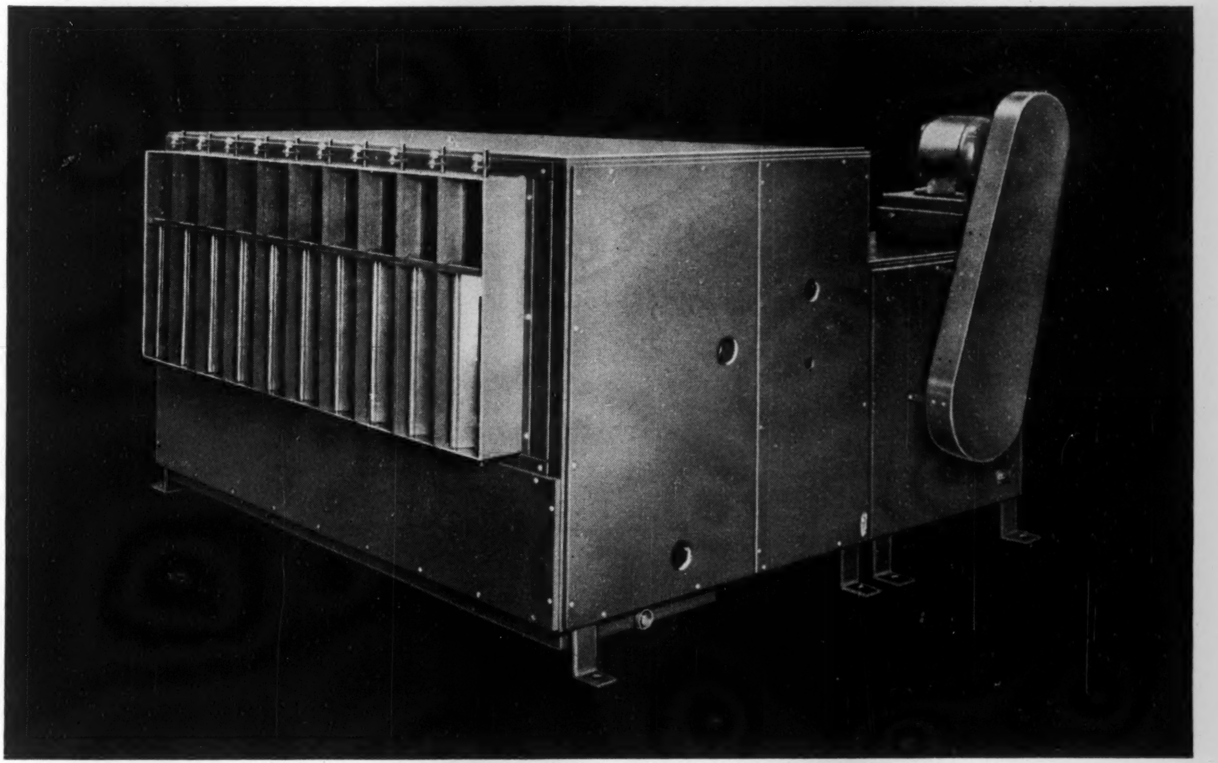
Here are some of the audited facts about business papers that A.B.C. reports tell the advertiser:

—how much paid circulation;
—how much unpaid;
—an occupational or business breakdown of subscribers;
—where they are located;
—how much subscribers pay;
—whether or not premiums are used;
—how many subscribers are in arrears;
—what percentage of subscriptions are renewed.

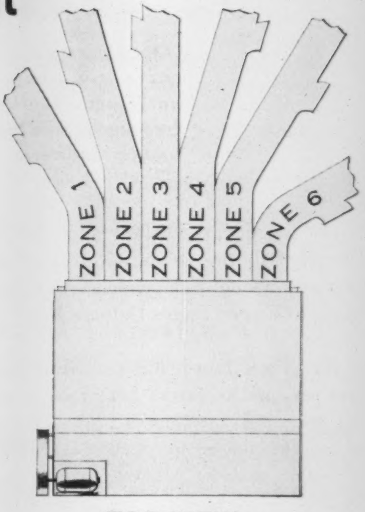
Those who buy advertising on the basis of this factual information, as given in A.B.C. reports, do not have to speculate about the distribution of their sales messages. They KNOW where and to whom their advertising goes. That is why this business paper is a member of the AUDIT BUREAU OF CIRCULATIONS. Ask for a copy of our A.B.C. report and then study it.

HEATING, PIPING & AIR CONDITIONING

A.B.C. REPORTS—FACTS AS THE BASIC MEASURE OF ADVERTISING VALUE



Now...A Westinghouse Multi-Zone Unit Automatically Conditions Air— Up to 12 Independent Zone Areas



TOP VIEW
(FOR SIX ZONES)

Multi-Zone Units are of the blow-through type with divided outlets to serve multiple zones by supplying heated or cooled air, or controlled mixtures of both, to each zone.

This rugged, compact central plant air conditioning unit supplies air, conditioned for simultaneous unequal heat load demands, in various zones requiring individual temperature and humidity control.

Formerly, heat load variations caused by differences in building construction, changes in occupancy, wind or solar exposure, could be controlled only by separate supply systems for each zone or by expensive zone reheat arrangements.

Now . . . this problem can be solved with a single Westinghouse Multi-Zone Air Conditioning Unit. Efficient . . . economical . . . this versatile unit supplies air—conditioned at a central location—for the individual needs of as many as 12 zones.

This complete unit—fans, coils, motors and starters—is designed and manufactured by Westinghouse, permitting a single equipment warranty with undivided responsibility . . . an exclusive feature in all Westinghouse Air Handling Units.

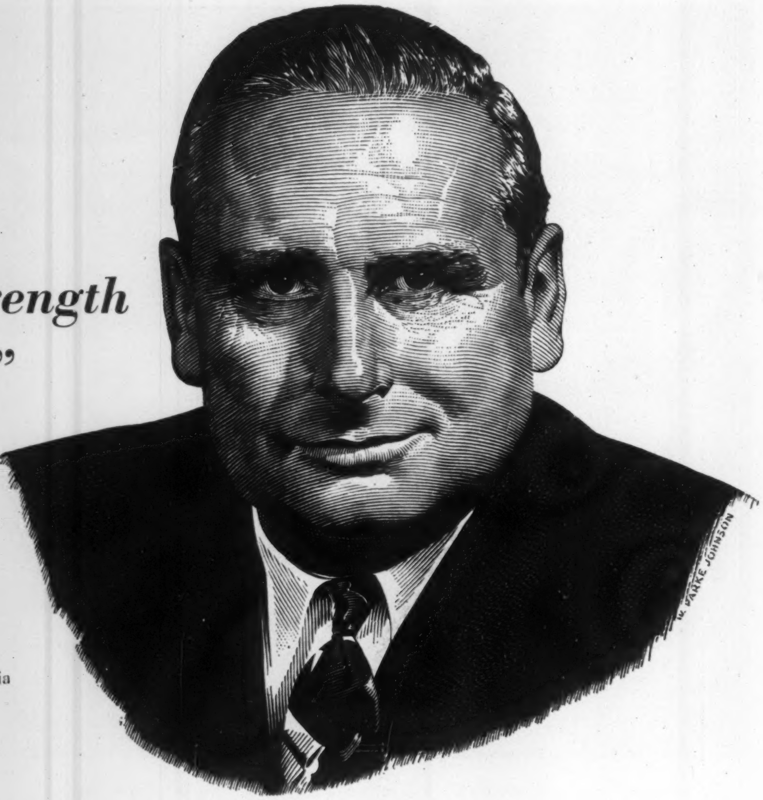
For complete information about this outstanding advance in central plant air conditioning, call your nearest Sturtevant Sales Engineer today. Or write: Westinghouse Electric Corporation, Sturtevant Division, Boston 36, Mass.

WESTINGHOUSE AIR HANDLING

YOU CAN BE SURE...IF IT'S **Westinghouse**

I-80393

"Our Country's Strength is Created . . ."



REESE H. TAYLOR
President, Union Oil Company of California

"Our country's strength is created by the responsibility and solidarity of individual citizens in a self-chosen government and economy. It can—and must—be perpetuated against all who seek to undermine it. The men and women who invest regularly in United States Defense Bonds are contributing to our national integrity and to the traditions of personal independence so characteristic of a free people."

Every pay day, 6,500,000 employed men and women . . . "are contributing to our national integrity and to the tradition of personal independence . . ." by the systematic purchase of United States Defense Bonds.

How important is this contribution to national economy and personal security? Let's look at a few figures.

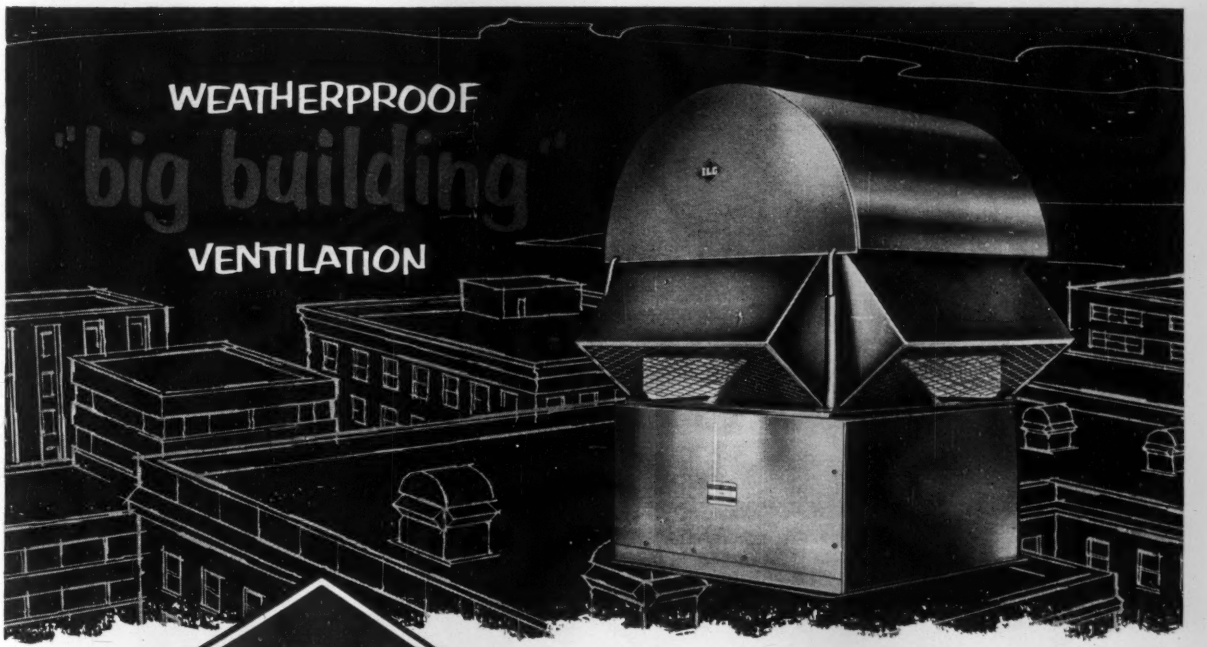
- the cumulative purchases of 6,500,000 Payroll Savers add up to $130,000,000 per month.
- the number of individual E Bonds sold in 1951 totaled 68,069,000 pieces—8% more than in 1950.
- purchases of $25 and $50 E Bonds—the denominations popular with Payroll Savers—were greater than the sales of $500 and $1,000 E Bonds.
- monthly redemptions of unmatured E Bonds during each of 9 months (April to December, 1951) were less than 1% of the amounts outstanding.
- the *cash value* of Series E Bonds held by individuals on December 31, 1951, amounted to $34,727,000,000—$4.8 billions more than the cash value of Series E's outstanding in August, 1945.

That Americans have built personal security and a reservoir of purchasing power exceeding $34.7 billions is due in no small measure to the patriotism and foresight of men like Mr. Taylor and other leaders of industry who have made the Payroll Savings Plan available to their employees.

For help with your Payroll Savings Plan, phone, wire or write to Savings Bond Division, U.S. Treasury Department, Suite 700, Washington Building, Washington, D. C.

The U.S. Government does not pay for this advertising. The Treasury Department thanks, for their patriotic donation, the Advertising Council and

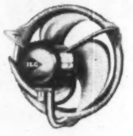
Heating, Piping & Air Conditioning



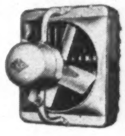
ILG®

POWER ROOF VENTILATORS

Easiest of all to install, wire and service



Propeller Fans

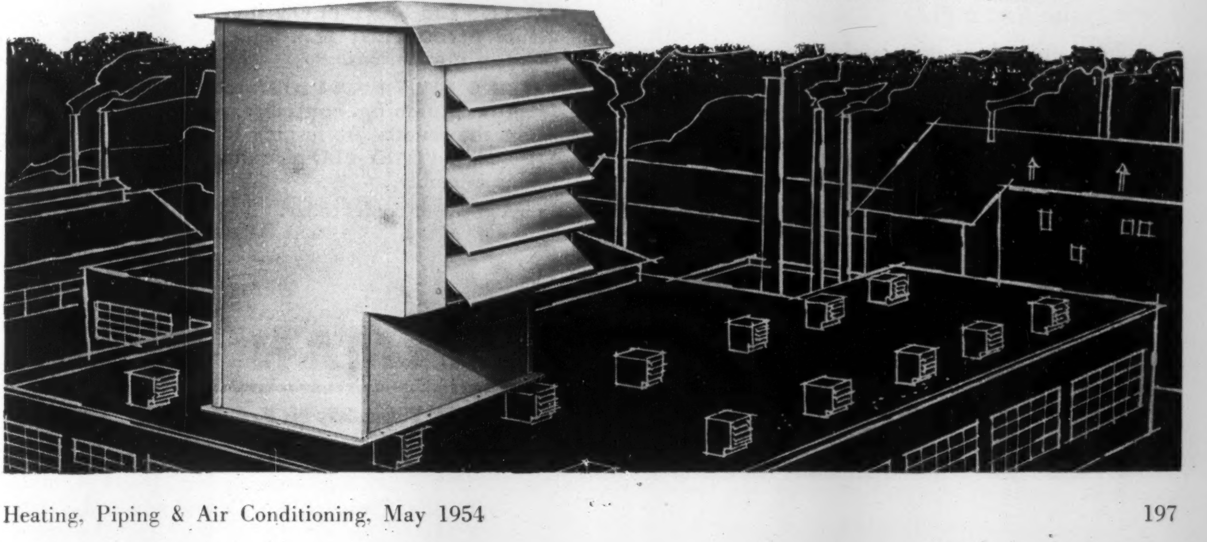


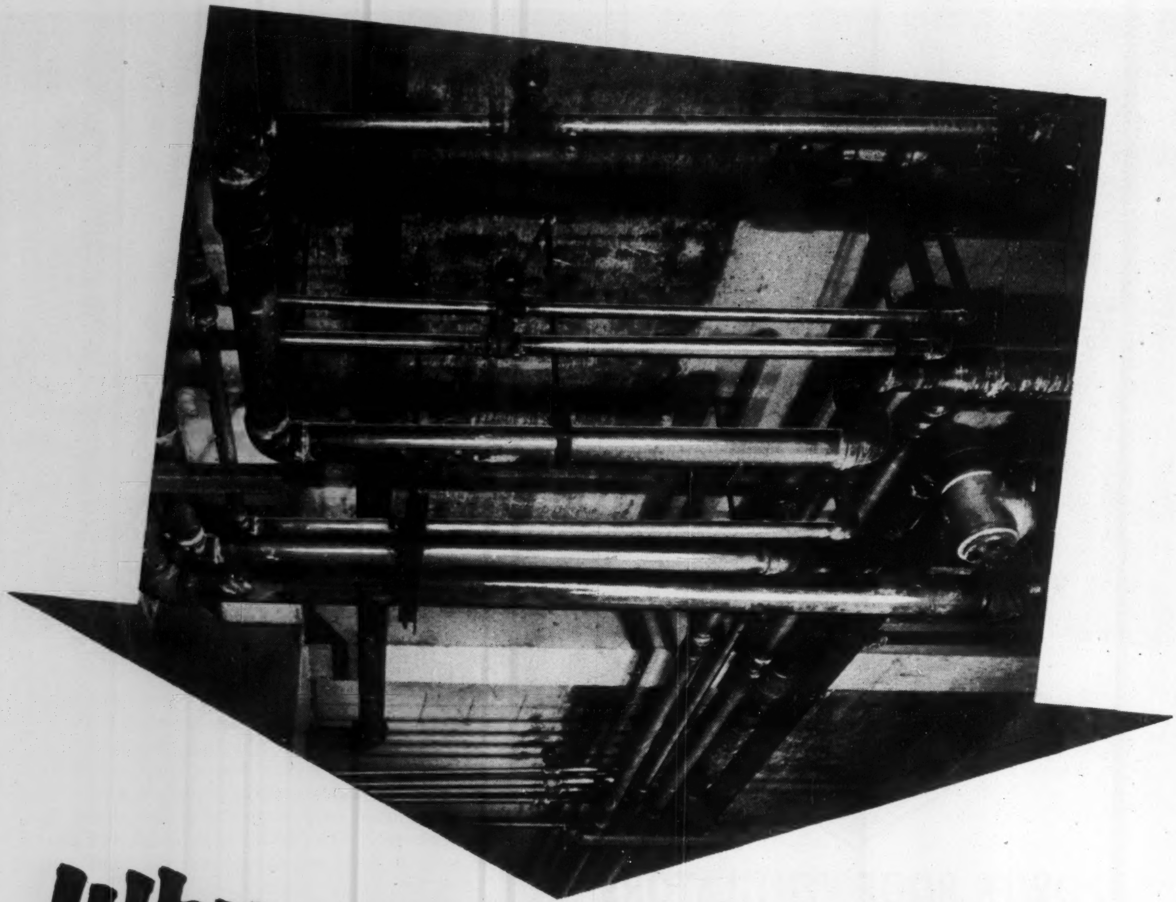
Unit Heaters

Centrifugal Fans

Whether you want to provide a pre-determined air volume for positive ventilation of *tall* apartments, office buildings, hotels—or large *sprawling* plant areas, you can always count on ILG Power Roof Ventilators to deliver quick, sure, dependable air exhaust in any weather. The "PRV" unit, illustrated above, is a direct-drive centrifugal fan type ventilator, ideal for exhaust from vertical flues in multi-story buildings or from duct systems. Available in 10 sizes for every need.
The Self-Cooled Motor type ventilator, below, has weatherproof steel penthouse with easy access to fan. Automatic Shutter protects fan and building interior—avoids overloading from wind pressure. Both types are amazingly easy to install, wire and service.
Nothing to get out of order—no lubrication required. Specify ILG—and be sure!

ILG ELECTRIC VENTILATING CO.
2850 N. Pulaski Road, Chicago 41, Illinois





Why will this piping never leak ...never need attention?

The answer to this question is found in the method used to install the piping—the modern threadless method of assembly with threadless fittings silver brazed with SIL-FOS or with EASY-FLO.

Not only does this method assure a permanently leak-proof, maintenance-free system, but it also makes assembly easier and faster. with proportionate savings in costs.

And another great advantage of the threadless method is the really tremendous savings in weight and metal it makes possible by permitting the use of thinner walled pipe and tubing.

GET THE FULL FACTS IN THESE BULLETINS

BULLETIN 20— tells you why the SIL-FOS and EASY-FLO alloys assure permanently leak-tight, care-free installations.

BRAZING NEWS No. 61 tells why leading plumbing contractors across the country are turning to SIL-FOS and EASY-FLO pipe and tubing assembly.

Write for your copies today.

EASY-FLO
SIL-FOS

HANDY & HARMAN
FOUNDED 1867
QUALITY · SERVICE
ORIGINATORS OF EASY-FLO & SIL-FOS

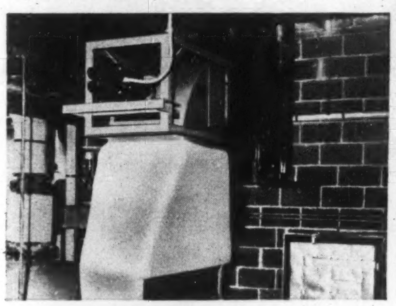
HANDY & HARMAN

General Offices: 82 Fulton St., New York 38, N. Y.

DISTRIBUTORS IN PRINCIPAL CITIES

OFFICES and PLANTS
BRIDGEPORT, CONN.
PROVIDENCE, R. I.
CHICAGO, ILL.
CLEVELAND, OHIO
DETROIT, MICH.
LOS ANGELES, CALIF.
TORONTO, CANADA
MONTREAL, CANADA

MOTORIZED CHIMNEY DRAFT



with the WING DRAFT INDUCER

No boiler can operate satisfactorily or efficiently over wide ranges of weather or load with variable natural draft. The fuel—whether oil, gas or coal—must have enough oxygen for complete combustion. There must be sufficient draft or furnace fires will be slow burning and lifeless, resulting in uneven, insufficient and irregular heat.

WING Draft Inducers insure positive, adequate, uniform draft regardless of variable weather conditions or inadequate chimney or breeching construction.

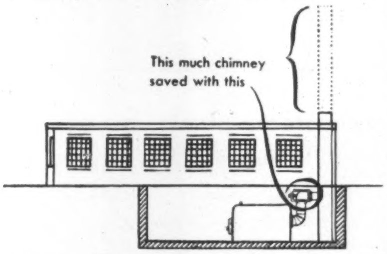


Diagram above shows how much chimney is saved by installing Wing Draft Inducers.

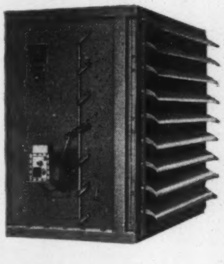
Wing Draft Inducers are suitable for use in connection with oil, gas, stoker-fired or hand-fired heating boilers, industrial furnaces or kilns, or high pressure steam boilers, either stationary or marine. Sizes are available for boilers as low as 1000 sq. ft. E. D. R. up to steam generators producing 100,000 pounds of steam/hr. Special, heavy duty designs available for these larger boilers.

Wing Draft Inducers are made in two types—for insertion in breeching or flue, or for installation on top of a chimney. Write for a copy of Bulletin 1-52 to L. J. Wing Mfg. Co., 140 Vreeland Mills Road, Linden, New Jersey.

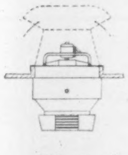
Is Your Plant EXHAUSTED?
(Exhausted of Air, that is!)

When air is exhausted from paint spray booths, from grinding, casting, chemical processing or other plant operations or is used in combustion, it must be replaced. Wing Fresh Air Supply Heaters provide the finest means of replacing exhausted air and supplying fresh air at the right temperature, winter and summer.

WING FRESH AIR SUPPLY HEATERS



WING FRESH AIR SUPPLY HEATER
for Window or Wall Mounting



At left is shown Fresh Air Supply Heater for mounting in roof or monitor opening.

Write for Bulletin

require no extensive duct work. They are mounted in window or wall openings or below roof or monitor openings.

HOW THEY WORK. They draw in the outside air at prevailing outside temperature and pass it through multiple by-passes and heating elements which are always under full steam pressure.

THEY CANNOT FREEZE. The heating coils can never freeze as they can where temperatures are controlled by throttling the steam supply.

UNIFORM DISCHARGE TEMPERATURES. The discharge airstream is uniform in temperature because of Wing's unique design and construction which combine several alternating by-pass and hot air passages. The multiple thin layers of hot and cold air mix almost instantly assuring uniformly warm air at the outlet.

L. J. Wing Mfg. Co. 140 Vreeland Mills Road, Linden, N.J.

Factories
Linden, N.J. & Montreal, Canada
In Europe: Etab. Wanson,
Brussels, Belgium

OUR 75TH 1879 YEAR

Wing

SEVENTY-FIVE YEARS AGO

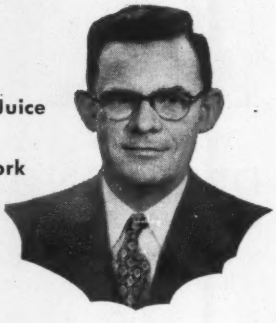
Three years before 1879, when the L. J. Wing Mfg. Co. was founded, President Grant and the Emperor of Brazil started the great Corliss Engine shown above, thereby opening the great Centennial Exposition in Philadelphia, symbolizing the new industrialism that was to transform America and the world.

UNIT HEATERS
FANS
BLOWERS
DRAFT INDUCERS
TURBINES

"WE GET BIG SAVINGS BY BURNING COAL THE MODERN WAY!

Other fuels would cost us far more!"

says
Mr. A. J. Monta,
Plants Engineer,
The Welch Grape Juice
Company, Inc.,
Westfield, New York



"We analyzed the cost of coal and other fuels before modernizing our power plant. The result is this up-to-date coal installation that delivers steam at half the cost of competing fuels. *For economy you can't beat* bituminous *coal burned the modern way!*"

Modern coal-burning and handling equipment saves this plant more than 35% on labor alone! New stokers, boilers, controls and coal-handling equipment cut labor costs and save this plant 18% on fuel. The complete installation will pay for itself in about 6 years.

● Burning bituminous coal the modern way can save you money, too! Labor costs are cut to a minimum with up-to-date coal- and ash-handling equipment... modern combustion installations deliver anywhere from 10 to 40% more power from every ton of coal!

That's why, if you're planning to modernize or build a new plant, it will pay you to get the latest facts on coal. Let a consulting engineer show you how a modern coal installation designed to meet your specific needs can save you real money.

Here's something more! Today's bituminous coal customers get a better-prepared product—designed to meet their special requirements. And bituminous coal offers future dependability no other fuel can match. Reserves are virtually inexhaustible, and America's coal industry is the world's most efficient —your assurance of dependable supply of coal at relatively stable prices for years to come.

If you operate a steam plant, you can't afford to ignore these facts!

COAL **in most places is today's lowest-cost fuel.**

COAL **resources in America are adequate for all needs—*for hundreds of years to come.***

COAL **production in the U.S.A. is highly mechanized and by far the most efficient in the world.**

COAL **prices will therefore remain the most stable of all fuels.**

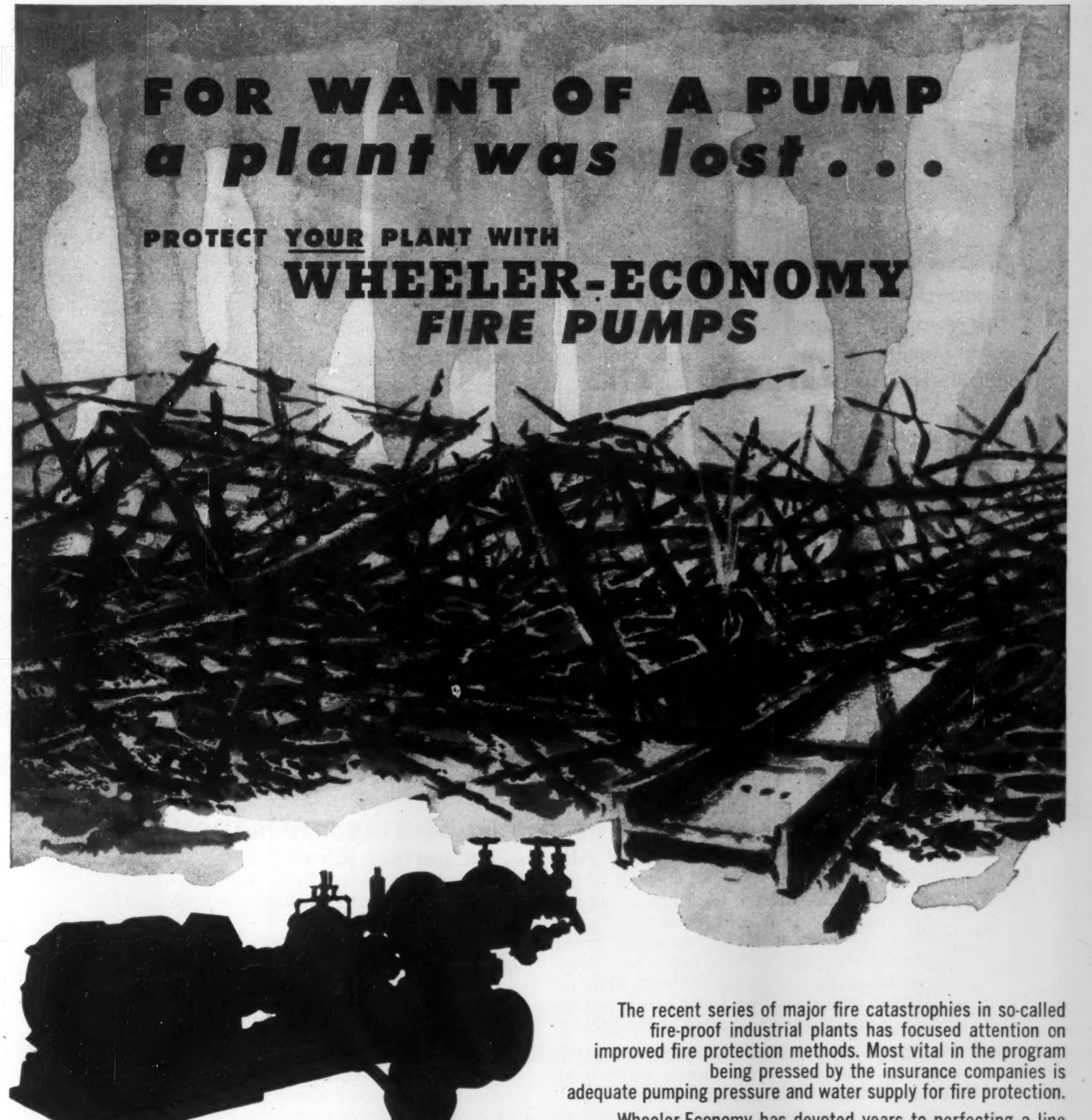
COAL **is the safest fuel to store and use.**

COAL **is the fuel that industry counts on more and more—for with modern combustion and handling equipment, the inherent advantages of well-prepared coal net even bigger savings.**

BITUMINOUS COAL INSTITUTE
A Department of National Coal Association, Washington, D. C.

FOR HIGH EFFICIENCY FOR LOW COST

YOU CAN COUNT ON COAL!



The recent series of major fire catastrophies in so-called fire-proof industrial plants has focused attention on improved fire protection methods. Most vital in the program being pressed by the insurance companies is adequate pumping pressure and water supply for fire protection.

Wheeler-Economy has devoted years to perfecting a line of Underwriter Laboratories and Factory Mutual Insurance Co. approved fire pumps.

Look into this line today . . . A Wheeler-Economy Fire Pump may save you untold losses in equipment, production and employment by being on the job with "pressure-plus" when fire breaks out.

Write for Bulletin and name of nearest Wheeler-Economy representative.

APPROVED UL FM

WE-402

WHEELER-ECONOMY PUMPS

ECONOMY PUMPS, INC. · DIVISION OF C. H. WHEELER MANUFACTURING CO.
19TH AND LEHIGH, PHILADELPHIA 32, PA.

DON'T BE SATISFIED WITH HALF-WAY MEASURES...

insist on Walseal® products and be certain

– the FACTORY INSERTED Ring insures FULL PENETRATION of the Silver Alloy . . . a perfect joint

Today, contractors . . . builders . . . architects are using brazed connections, in ever increasing numbers on their brass and copper pipe runs. However, they must be certain that the correct brazing alloy is used; that the joint has penetration of alloy up the shoulder of the fitting.

That's why more and more are turning to Walseal joints made only with Walseal valves, fittings and flanges which assure the proper amount of alloy with no waste. They know that the finished joint not only will withstand hydrostatic pressure, but it will also withstand terrific impact and vibration – in fact, no correctly made Walseal joint has ever been known to creep or pull apart under any pressure, shock, vibration or temperature which the pipe itself can withstand.

Furthermore, it is a relatively simple operation to make a joint – no heavy scaffolding need be erected . . . just cut the pipe, flux, assemble, then braze, following the technique recommended by the Walworth Company. A silver brazing alloy – FACTORY INSERTED – in each port flows out when heated with the oxyacetylene torch, making a joint that is stronger than the pipe itself . . . a one-hand operation, with the mechanic out of the path of the deflected heat – at all times.

For full information about Walseal joints made only with Walseal products, write for Circular.

WALWORTH

valves and fittings

60 EAST 42nd STREET, NEW YORK 17, N. Y.

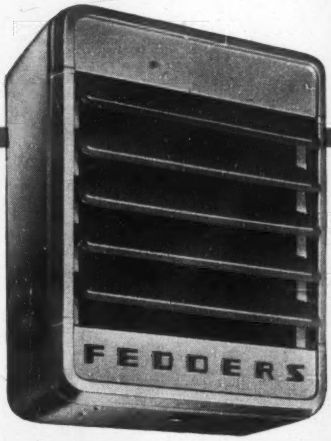
SEE OUR CATALOG IN SWEET'S

DISTRIBUTORS IN PRINCIPAL CENTERS THROUGHOUT THE WORLD

FEDDERS gives you

3 QUALITY LINES OF UNIT HEATERS

Fedders Horizontal and Downblow Unit Heaters have been making warm friends in thousands of installations everywhere. Fedders design, combining high heat transfer efficiency with forced air circulation in a compact unit, has made them universally accepted as an ideal, economical, efficient and flexible method of heating.

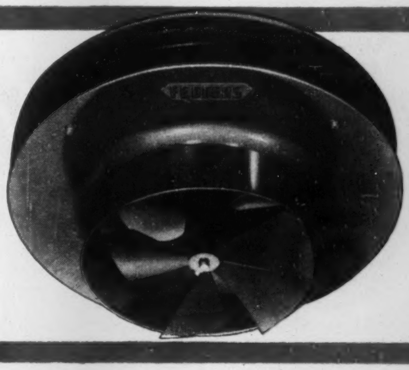


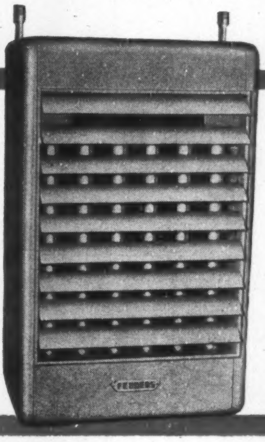
SERIES 17 HORIZONTAL

Thousands used throughout business and industry. Handsome appearance, rugged construction, high efficiency heating element and quiet, rubber-mounted fans. Capacities from 93 to 1225 EDR.

SERIES 16 DOWNBLOW

Deliver heat down from relatively high locations and for lower levels with spot conditions. Single and multiple cone diffusers available. Capacities from 180 to 2050 EDR.





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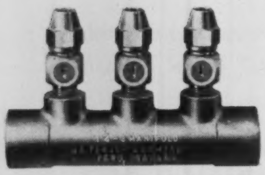

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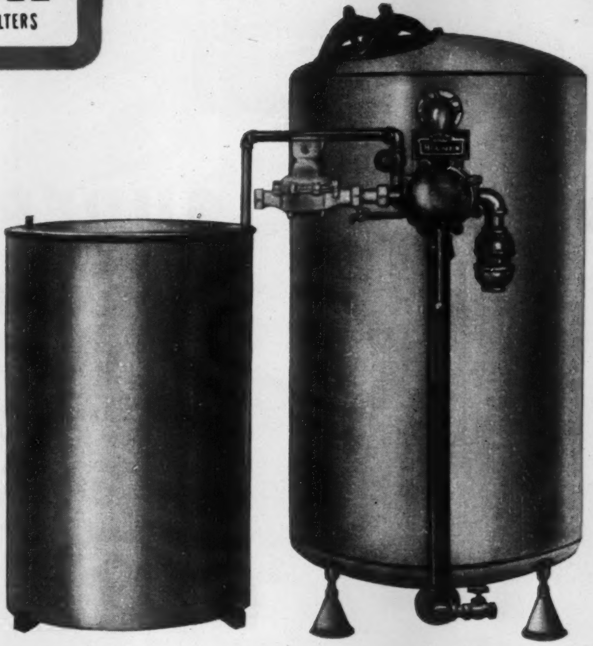

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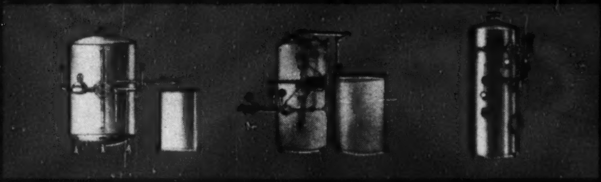

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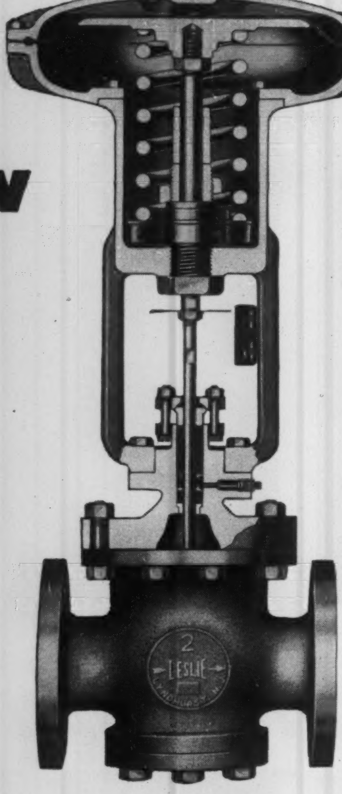

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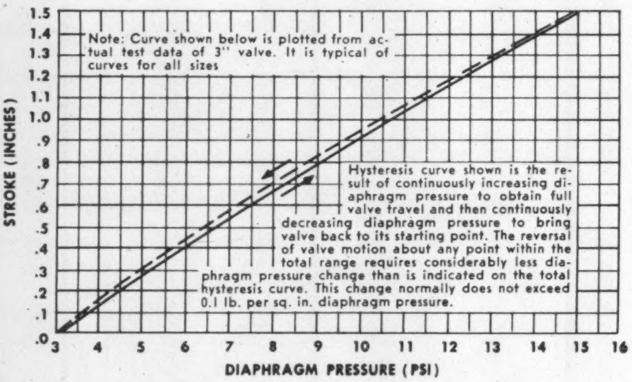

Note: Curve shown below is plotted from actual test data of 3″ valve. It is typical of curves for all sizes

Hysteresis curve shown is the result of continuously increasing diaphragm pressure to obtain full valve travel and then continuously decreasing diaphragm pressure to bring valve back to its starting point. The reversal of valve motion about any point within the total range requires considerably less diaphragm pressure change than is indicated on the total hysteresis curve. This change normally does not exceed 0.1 lb. per sq. in. diaphragm pressure.

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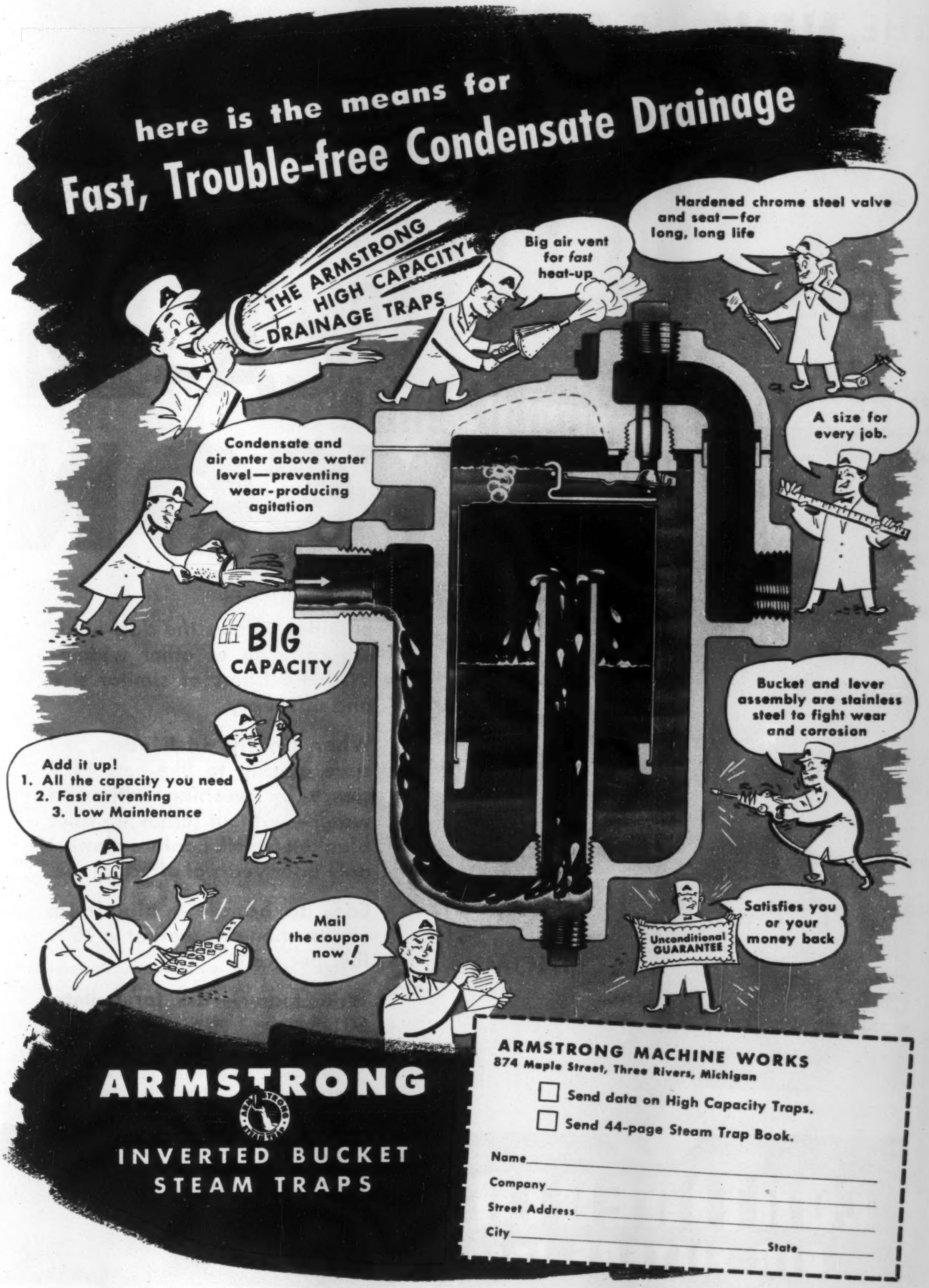
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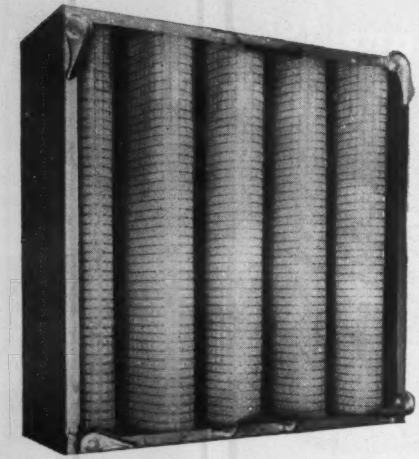

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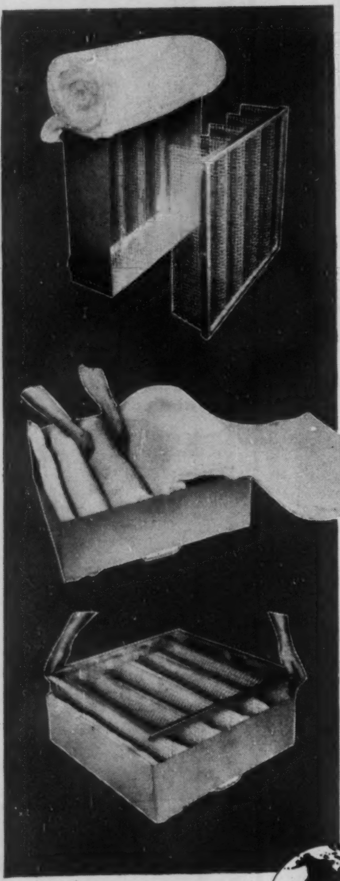

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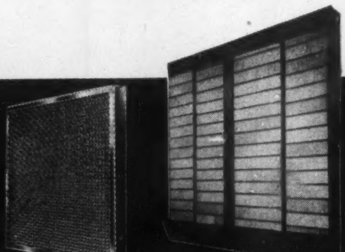

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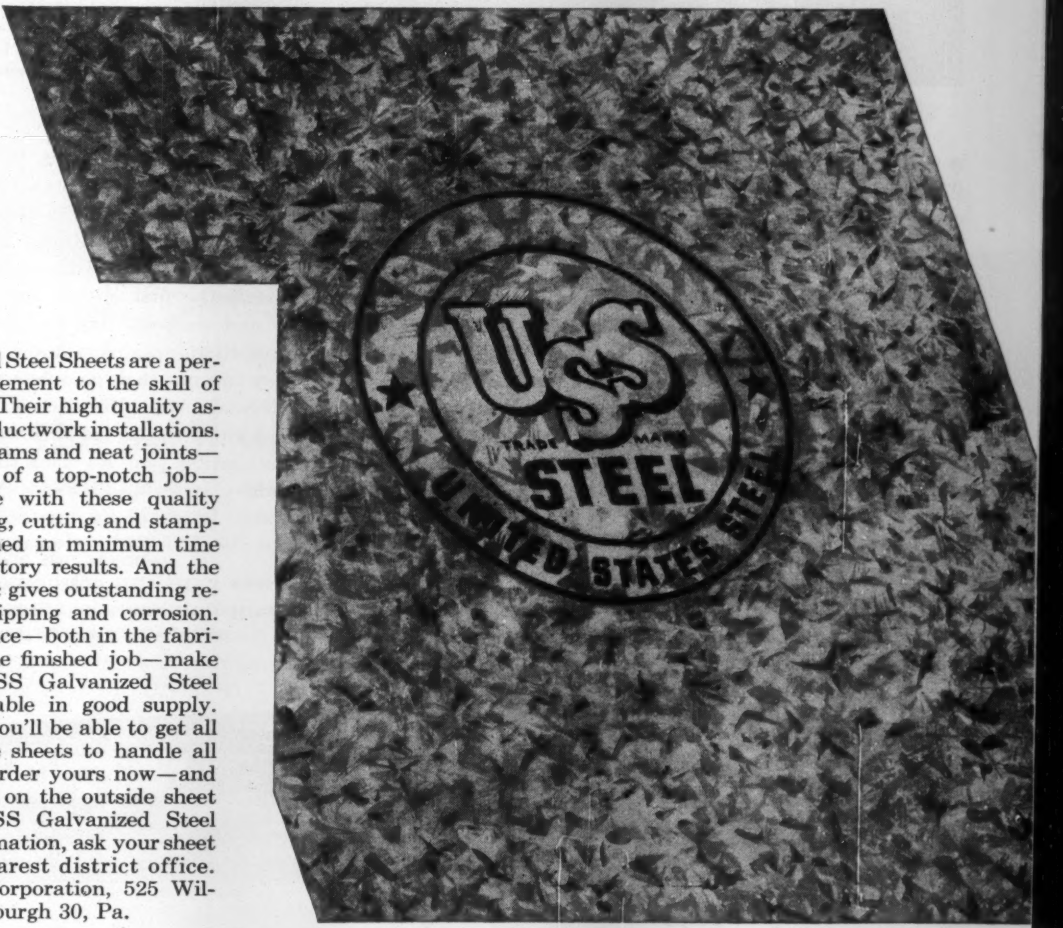

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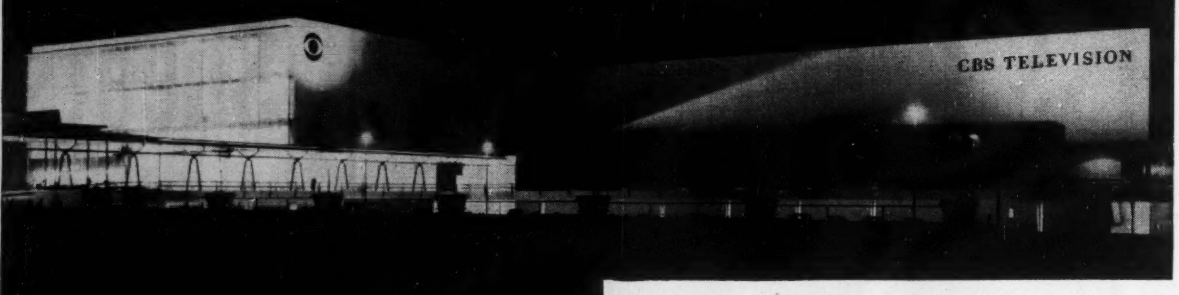

"TELEVISION CITY"—CBS-TV's West Coast studios reflect the efficiency, flexibility and expansibility of their design. Architects • Engineers: Pereira & Luckman. General Contractor: William Simpson Construction Co.

● The Columbia Broadcasting System's clean-lined "Television City" in Hollywood, California is the core of an anticipated 25-acre, 24-studio expansion of the network's West Coast TV production facilities. Plans for future enlargement of the building specify that the present walls be easily demountable. Consequently, most of the exterior is composed of large, plain, movable steel panels and glass walls.

The sleek lines of the structure manifest the ideas of efficiency and flexibility upon which the design was based. With such key words as a guide to design, it is a foregone conclusion that the most efficient and dependable pipe and tubing should be chosen for the building's plumbing and heating systems. NATIONAL Steel Pipe got the nod.

For over 60 years NATIONAL has been the accepted standard pipe for conventional hot water and steam heating systems, fire control, and plumbing lines. And today, it is the first choice, too, for modern radiant heating and snow melting installations. Regardless of the application, architects know from long experience that they can put their complete confidence in the uniform, dependable performance of NATIONAL Pipe.

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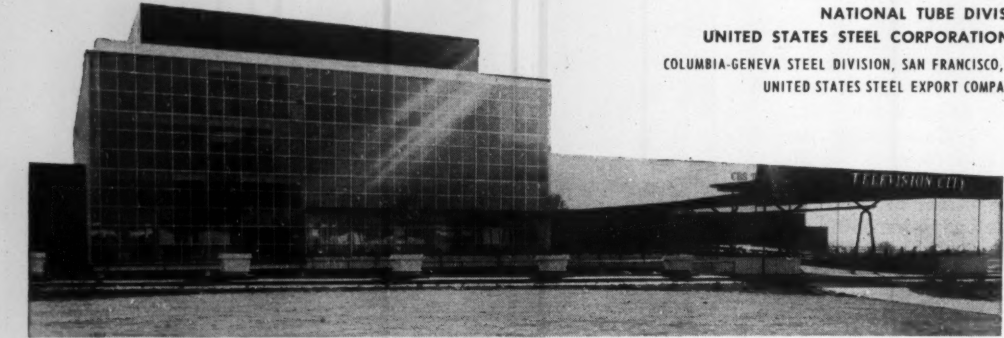

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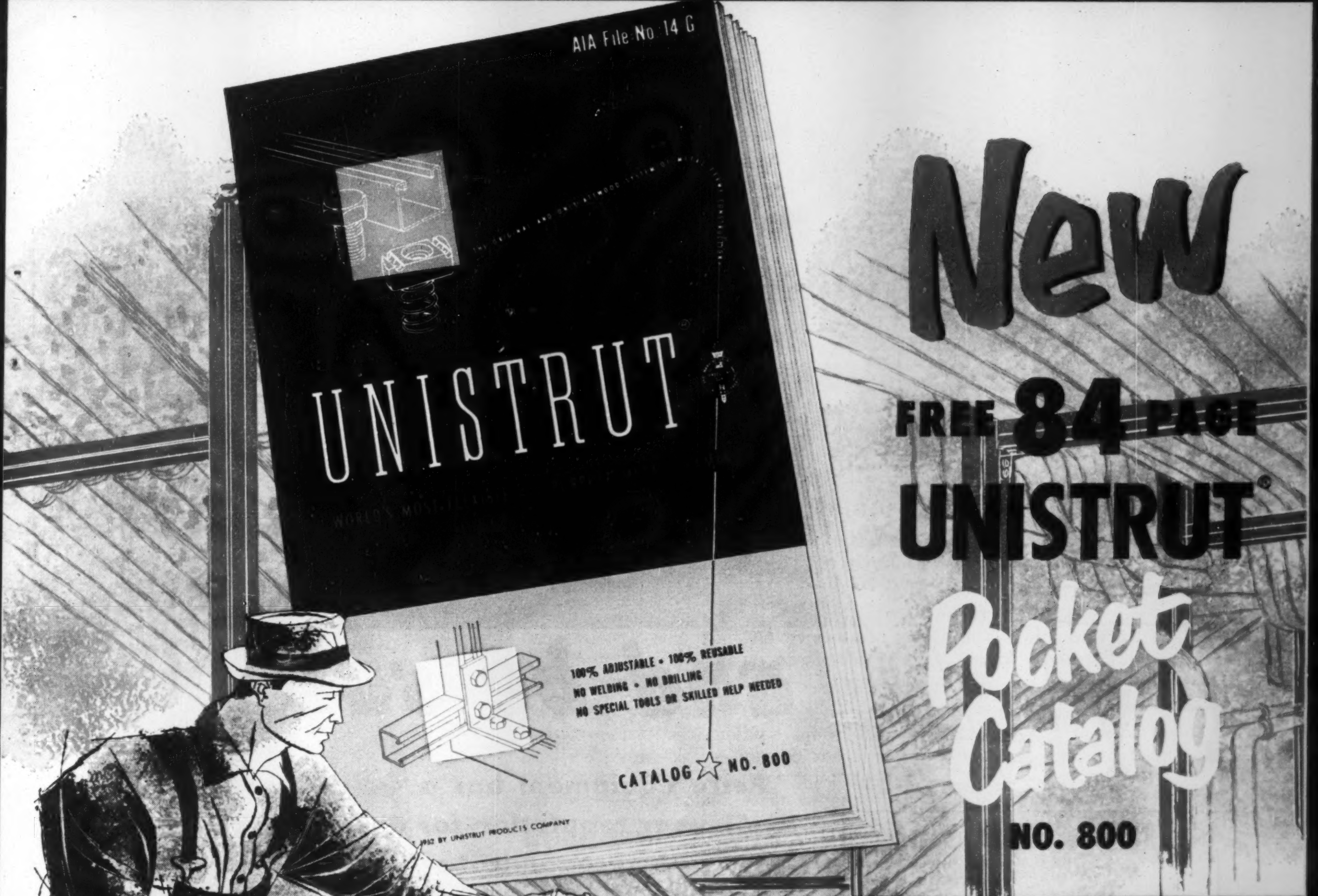
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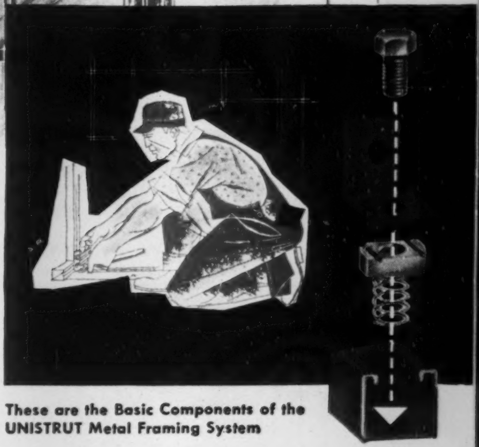

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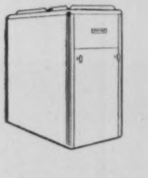

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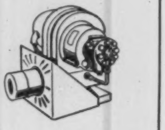

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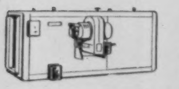

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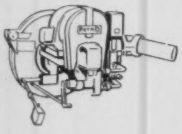

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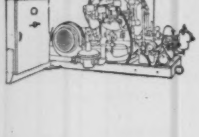

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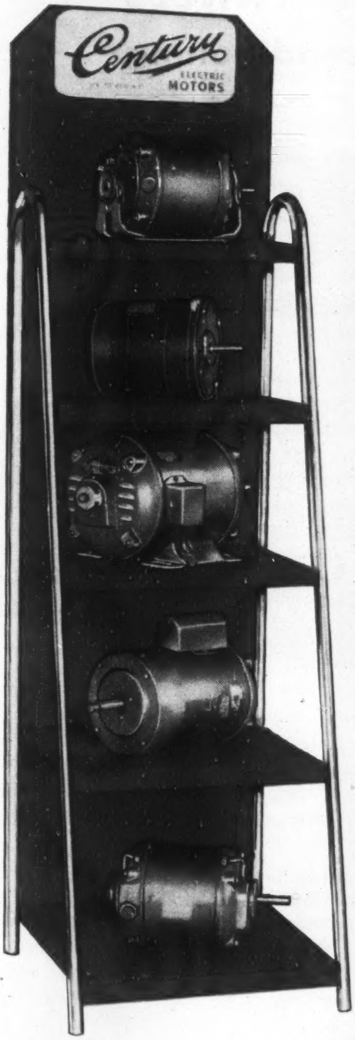

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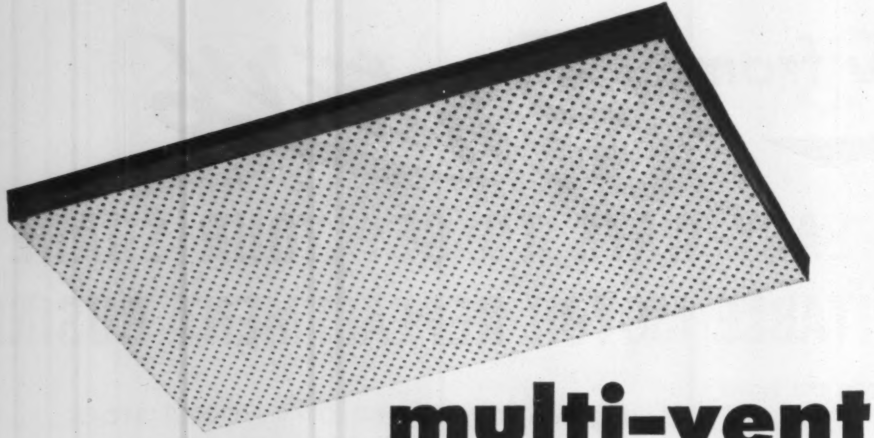

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A steam trap should never be selected arbitrarily. The efficiency of an expensive piece of equipment may be reduced by as much as 35% when it is not properly drained of condensate or if the air is not removed. A steam compartment partly filled with air, instead of being entirely filled with dry hot steam, will not reach maximum temperature which means that the steam unit does not handle as much production as it should.

Trap Rating

Steam traps are rated on continuous flow—the amount of hot condensate that flows through the trap when the valve is wide open. However, although this is the accepted method for rating traps; these figures are trap ratings, not capacity in operation.

The rating of the trap selected should always be more than the actual amount of condensation to be handled. This procedure is necessary since condensation capacities are based on continuous flow, whereas traps operate intermittently, open half the time and closed half the time. In addition, a pressure drop when steam is first turned on, reduces the pressure differential which then reduces trap capacity at a time when the load is heaviest. Further considerations affecting the factor are the heating-up time desired, and the necessity for venting large quantities of air.

Trap Capacity Factors

For this reason it can be readily seen that with most inverted bucket traps the factor selected should never be less than two and sometimes as high as five or six, depending on conditions. However, when Heat-Kwik Super-Silvertop steam traps are used, it is never necessary to use a trap factor of more than 2; and often 1 is sufficient. This is possible because Heat-Kwiks have two separate condensate and air orifices, compared to one venting orifice of other traps. Heat-Kwiks can purge large quantities of air very rapidly; and also handle larger quantities of condensate. Your use of Heat-Kwiks assures selection of traps with ample capacity so that your equipment operates at top efficiency.

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ON ALL PRODUCTION UNITS

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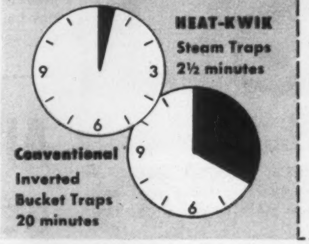

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Here's why G-E Packaged Units were selected and why more and more buildings of all kinds are being cooled in this way.

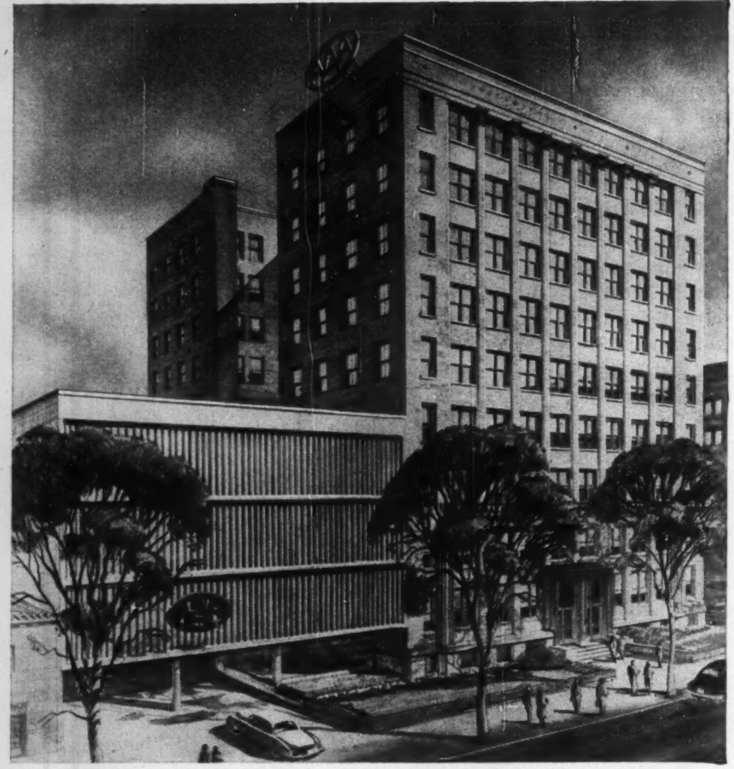
LOW FIRST COST. Equipment is priced surprisingly low. Installation costs are low, too, for remodeling can be held to a minimum. Duct runs are shorter than would be required for a central system. In many applications they are not required at all. No machinery rooms, either.

FIT EVERY APPLICATION. The adaptability of G-E units is unmatched. 3 different sizes were used in the AAA Building, and G.E. makes even more—enough to fit any situation, in-space or out-of-space. They take little floor-space, can be squeezed into corridors and little-used areas.

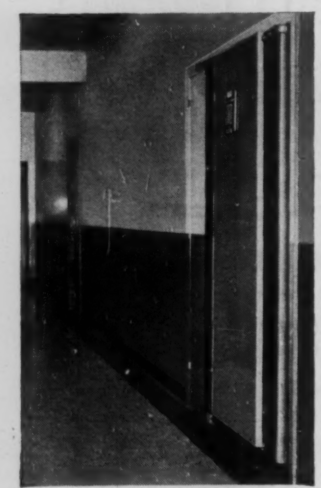
PARTIAL OPERATION. Zoning is simplified. When only part of a building is in use, units in other areas can be shut off, saving money.

G-E 5-YEAR WARRANTY is another advantage over central systems. G.E.'s sealed-in-steel cooling unit is so trouble-free that G.E. provides 5 years' protection (including labor) on the entire refrigeration cycle. Don't forget, with G-E no expensive maintenance crews are needed.

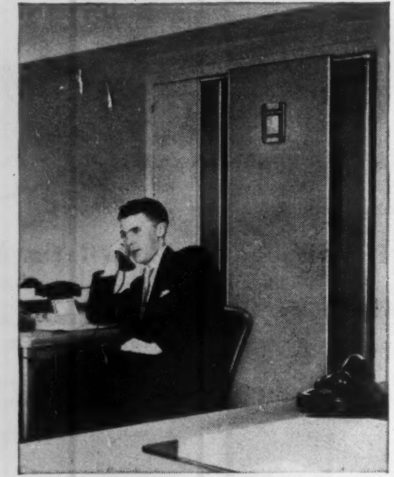
To find out how you can use G-E Packaged Air Conditioners profitably, write General Electric Company, Sec. HP-4, Air Conditioning Division, Bloomfield, N. J.



NEWLY REMODELED American Automobile Association Building in Washington, D. C., is air conditioned by 3 G-E Packaged units on each floor. Architect for remodeling was A. R. Clas; George H. Riggs, Jr., associate. Consulting engineers: Lanier & Levy. General contractor: Wm. P. Lipscomb Co. Mechanical contractor: Morris and Eagan Co.



RECESSED IN CORRIDOR WALL, this 7½-ton G-E unit sends conditioned air to surrounding offices. Air returns through louvers in doors to unit.



IN-SPACE APPLICATION of 5-ton G-E unit. It air conditions large membership room in which it is located plus other offices. Note streamlined vertical air inlets.

FOR BIG DRAFTING ROOM and other areas, G-E 10-ton unit provides quiet, steady cooling. Individual units like this can be turned off when not needed—others can be left on.

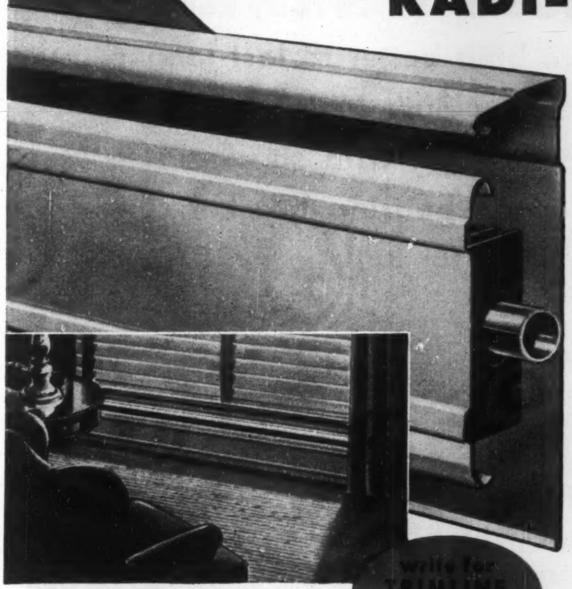
Packaged AIR CONDITIONERS

GENERAL ELECTRIC

Make the MOST

of every residential baseboard installation

with new TRIMLINE RADI-VECTOR*



TYPICAL TRIMLINE INSTALLATION

write for TRIMLINE Catalog 54

Vulcan's NEW, TRIMLINE COVER is designed for enduring beauty . . . built to harmonize with any residential decor. The STREAMLINED top of cover reduces apparent depth. Front easily removed for cleaning. TRIMLINE is so sleek that furniture can be arranged without affecting the radiation of heat. All floor space is LIVING space with TRIMLINE!

Here's how:

EASY TO STOCK . . .

TRIMLINE is easy to stock. One piece top and back may be ordered in desired lengths with front, snap-on covers, to match. Fewer joints, less fittings, accessories, save space. Packaged units solve inventory problems.

CUTS HANDLING COSTS . . .

TRIMLINE is easily handled. Light in weight, with covers up to sixteen feet in continuous lengths, presents no handling problems. No field cutting necessary. Dampers may be installed anywhere, any time, on the job.

SAVES INSTALLATION TIME . . .

TRIMLINE assures new installation efficiency. Vulcan's famous rod hangers give complete freedom of movement for suspension. They provide for planned expansion. Support brackets slide in . . . no screws or nails necessary.

IN THE "LONG RUN" VULCAN COSTS LESS . . .

TRIMLINE radiation keeps cost down. New TRIMLINE features save time and money. All parts mount on one piece top and back. Unit backs up on studs. Saves labor because of fast installation.

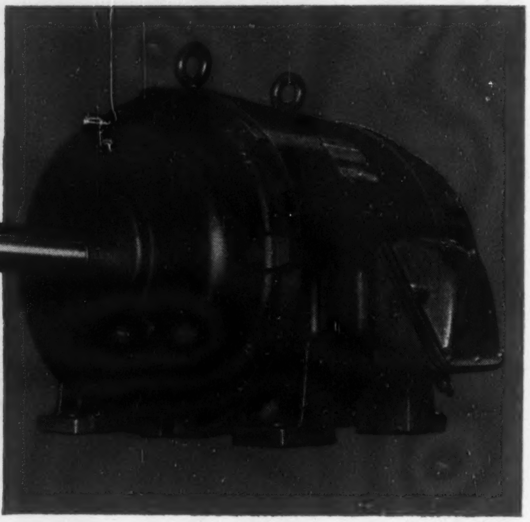
Over 28 Years a Leader in Fin-Tube Radiation

Complete I=B=R Ratings—Representatives in Principal Cities

***Trade-mark Reg.**

Also made in Canada under Trade Name of Heal Radiation by Vapor Car Heating of Montreal

The VULCAN Radiator Co., 26 Francis Ave., Hartford, Conn.



"ALL MOTORS ARE NOT ALIKE!"

FOR RUGGED SERVICE, Reliance Motors are built better to last longer. These *Precision-Built* Motors combine maximum strength with shock-resistant frame and bearing-bracket construction. Write for Bulletin B-2101.

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Precision-Built
MOTORS

B-1470

RELIANCE ELECTRIC AND ENGINEERING CO.

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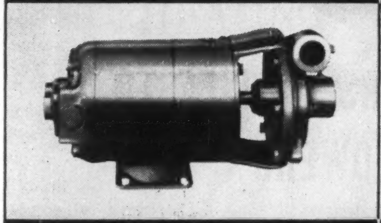
LOOK TO THE LEADER—*LOOK TO PEERLESS*

For All Your Needs for END-SUCTION PUMPS

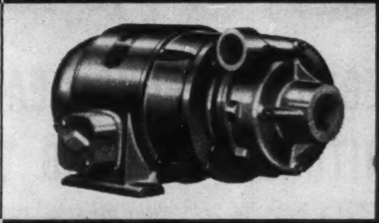
IT'S THE PEERLESS *Fluidyne* LINE

FOR ALL THESE MODELS

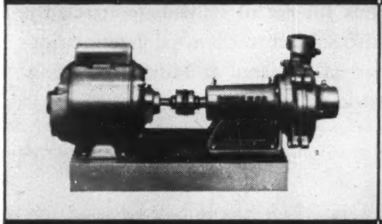
¼-1½ hp FACEMOUNT



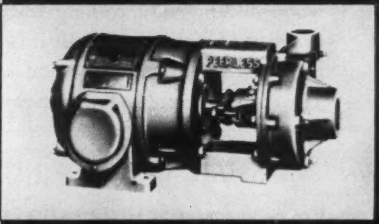
2, 3, 5 hp FACEMOUNT



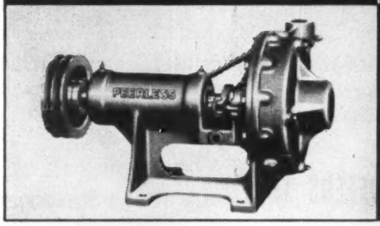
FLEXIBLE-COUPLED Fractional hp



5-50 hp DIRECT CONNECTED



FLEXIBLE-COUPLED Integral hp



FLUIDYNE LINE CHARACTERISTICS

HEADS:	Up to 260 ft.
CAPACITIES:	5 to 5500 gpm
MOTOR SIZES:	¼ to 150 hp

PEERLESS PUMPS

For All Your Air Conditioning Applications There's One Line of Pumps That Has Been Proved—The Peerless Fluidyne Line.

THOUSANDS SOLD FOR:

(1) COOLING TOWERS
(2) CHILLED WATER SERVICE
(3) HEAT EXCHANGERS
(4) COMMERCIAL AND RESIDENTIAL AIR CONDITIONING
(5) BOOSTERS
(6) TRANSFER SERVICE

ALSO CHOOSE PEERLESS FOR THESE OUTSTANDING MECHANICAL FEATURES

Stainless Steel Shaft
(Rust-Proof—Corrosion-Free)

Mechanical Shaft Seal (Leak Proof)
In Models up to 5 hp Type PE
In Models up to 1½ hp Type PB

Bronze Impeller
(Same as used in Largest, Highest Quality Industrial Pumps)

Cast Iron Case
(Heavy and Durable)

Nationally-Known Motor Brands
(Fully Guaranteed)

It's the Fluidyne Line for ALL THESE OUTSTANDING FEATURES:

They're ECONOMICAL. Designed with economy in first cost, installation, maintenance and operation in mind—all without compromise in quality.

They're DURABLE. Every consideration has been given in design and construction to assure long service life even under abnormal service.

They're EFFICIENT. In all sizes, types and models the Fluidyne line is characterized by high performance ratings.

They're VERSATILE. Indoors or out, every general utility pumping service can use Peerless Fluidyne Pumps.

They're COMPACT. Space costs money; Fluidyne pumps fit neatly into both piping and pumping layouts as well as into sub-assemblies.

They're EASILY MAINTAINED. No special tools are required to perform ordinary pump maintenance in the Peerless line.

PEERLESS PUMP DIVISION
FOOD MACHINERY AND CHEMICAL CORPORATION
Address Inquiries to Factories at:
Los Angeles 31, California or Indianapolis 8, Indiana
Offices: New York; Atlanta; St. Louis; Dallas, Plainview and Lubbock, Texas; Albuquerque; Phoenix; Los Angeles; Fresno

PEERLESS PUMPS

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Please send me a copy of Peerless Fluidyne Line Pump Bulletin No. B-2300.

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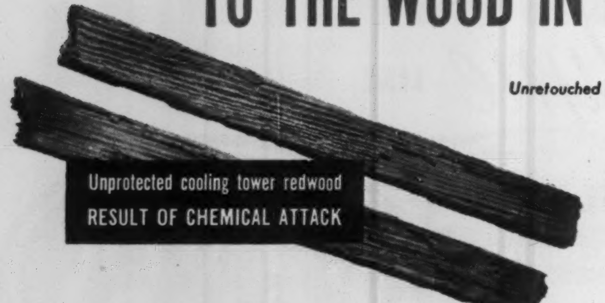
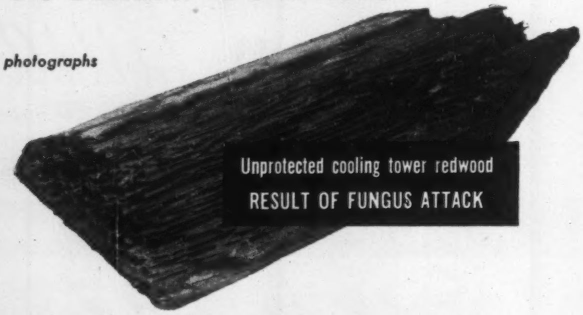
HP&AC

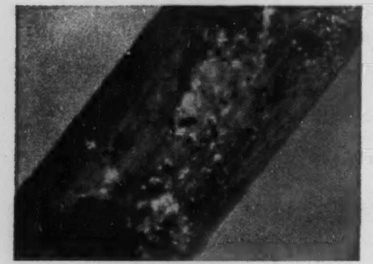
LOOK WHAT CAN HAPPEN TO THE WOOD IN COOLING TOWERS

Unretouched photographs


Unprotected cooling tower redwood
RESULT OF CHEMICAL ATTACK

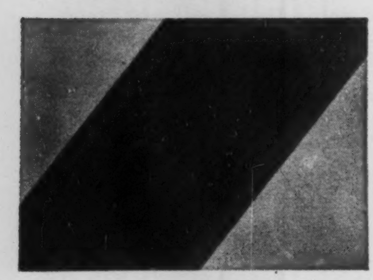

Unprotected cooling tower redwood
RESULT OF FUNGUS ATTACK

PRESSURE CREOSOTING ADDS YEARS OF LIFE TO HALSTEAD & MITCHELL COOLING TOWERS


FUNGUS ROTTED UNPROTECTED DECKING

Unretouched photographs

CLEAN PRESSURE-CREOSOTED DECKING



Examine these unretouched photographs carefully. Constantly wetted wood decking in a cooling tower is subject to immediate attack by fungus and marine parasites. It is also subject to chemical deterioration from acids in water. All wood used in Halstead & Mitchell Cooling Towers is protected against these twin enemies.

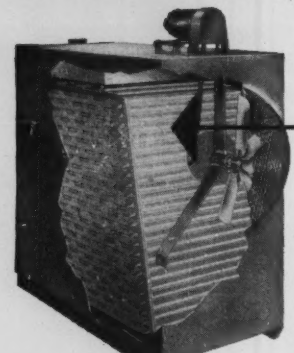
WHY PRESSURE CREOSOTING?

Creosote . . . *with 162 elements toxic to fungus growth and parasites* . . . also makes wood more resistant to chemical attack. Deep penetration of the wood by Koppers Pressure-Creosoting gives the longest possible wetted decking life. Therefore, all Halstead & Mitchell Cooling Tower decks are Pressure-Creosoted, and are guaranteed against rotting due to fungus growth . . . for 20 years!

ONLY HALSTEAD & MITCHELL OFFERS THE

20-Year Guarantee!

ON THE WETTED DECK SURFACE against rotting by fungus attack



2 thru 100 Tons

- Sheet-Steel Cabinets, 5-times protected
- Stainless Steel Fans and Shafts
- Weather Shielding
- Everdur Bolts for ease of disassembly at any time.

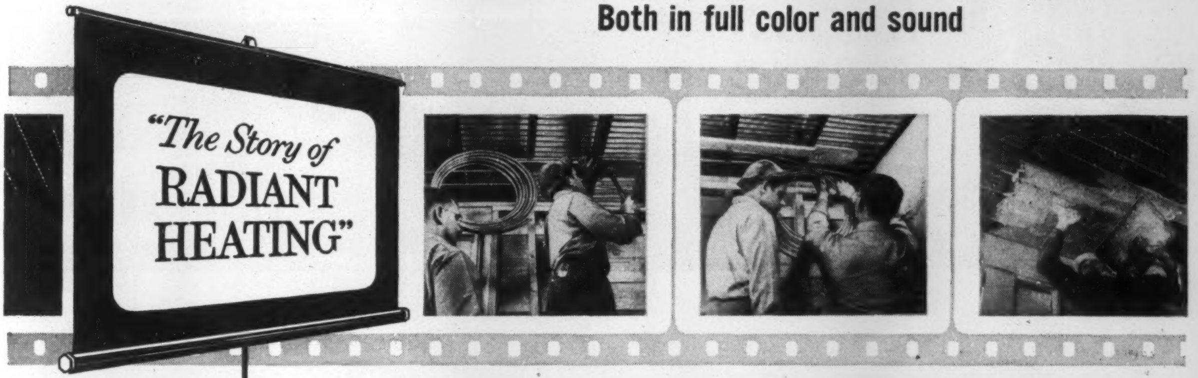
At Leading Refrigeration & Heating Wholesalers Everywhere

HM
Halstead & Mitchell

OFFICES: Bessemer Bldg., Pittsburgh 22, Pa.

You'll want to see these 2 NEW CHASE MOVIES!

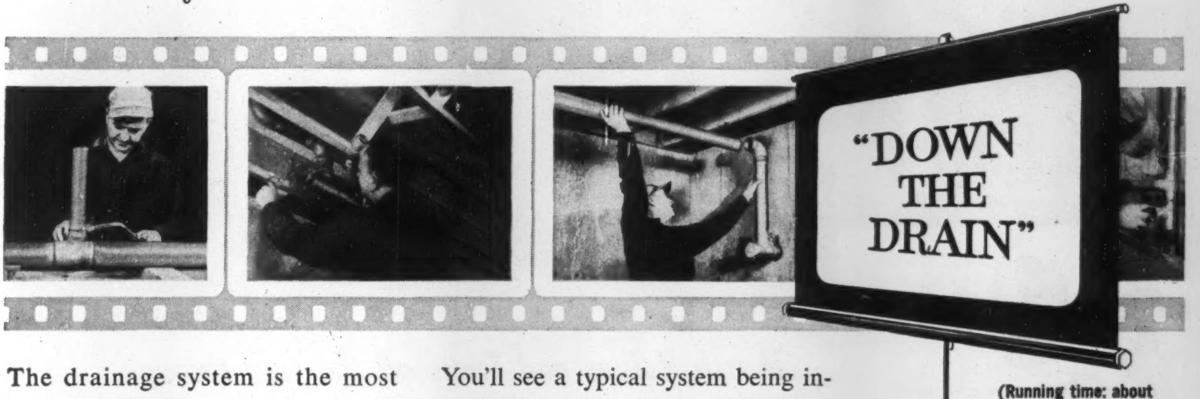
Both in full color and sound



(Running time: about 15 minutes. 16 mm)

This movie tells the fascinating story of how nature's way of heating has been put to work for man.

After explaining the *theory* of radiant heating with interesting animated sketches, it takes you along on a typical installation trip—and shows you every important phase of a ceiling and floor slab installation from start to finish.



(Running time: about 11 minutes. 16 mm)

The drainage system is the most important health precaution in the home. This movie shows how copper soil, waste and vent lines are installed with less effort...quicker and neater...and at no extra cost.

You'll see a typical system being installed in a typical home. You'll see the whole job—from initial selection of copper tube and solder-joint fittings...to the final testing of the finished job.

Chase®

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Visit Chase Booth 563 at the Annual Convention, National Association of Plumbing Contractors, National Guard Armory, Washington, D. C., May 10 to May 13.

TO ARRANGE A SHOWING

These movies are available to Plumbing and Heating Wholesalers, Plumbing and Heating Contractors, Building Contractors, Architectural Schools and Associations, Trade Schools and others interested in plumbing and heating. Make arrangements through any Chase Plumbing and Heating Wholesaler or Chase Sales Office.

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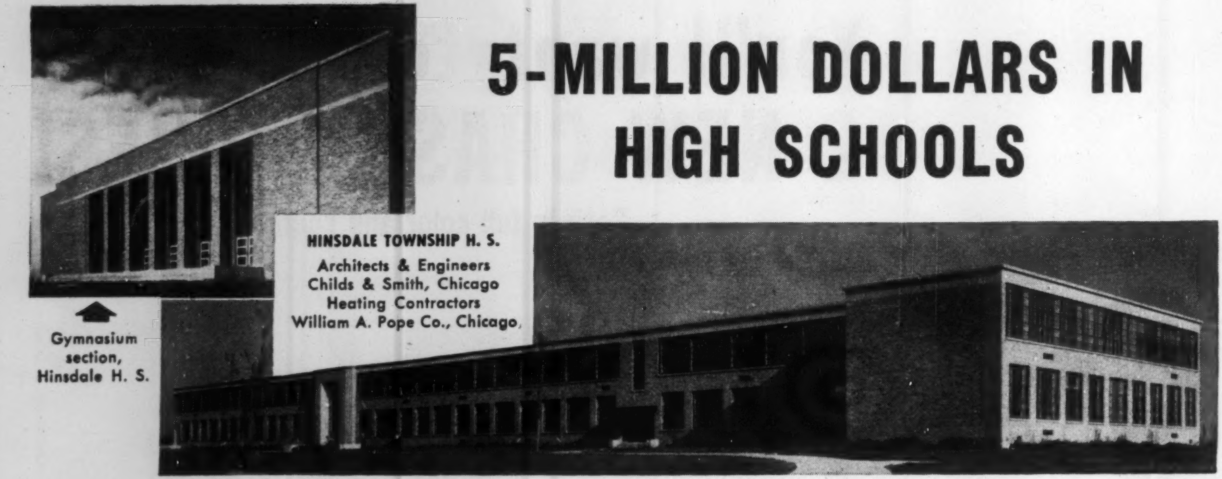
5-MILLION DOLLARS IN HIGH SCHOOLS

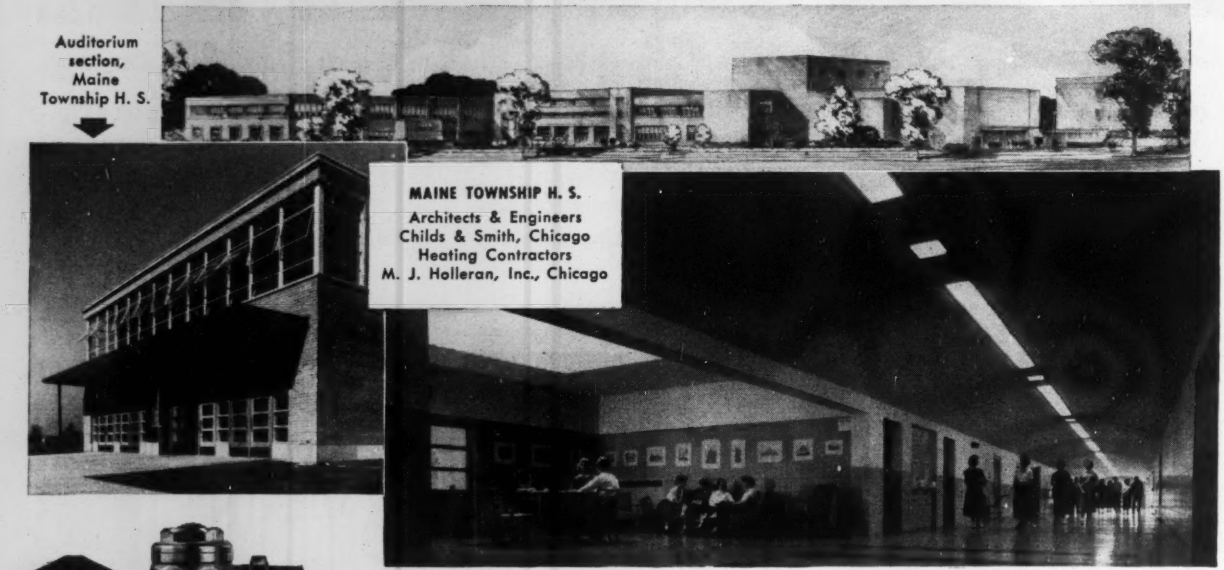


HINSDALE TOWNSHIP H. S.

Architects & Engineers
Childs & Smith, Chicago
Heating Contractors
William A. Pope Co., Chicago

Gymnasium section, Hinsdale H. S.

Auditorium section, Maine Township H. S.



MAINE TOWNSHIP H. S.

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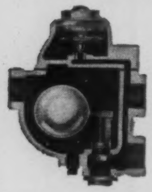
Famous 600-ft. corridor, Maine Township H. S.

Marsh Valves and Traps all the way through

The great combination: Marsh packless — *truly packless* — radiator valve and the trouble-free Marsh thermostatic trap.



The Marsh float and thermostatic trap. There is a Marsh trap for every heating service.

The answer of three Chicago suburbs to the bumper crop of teen-agers . . . these two college-size high schools. Among America's largest and finest, they cost 5 millions and contain 337,000 sq. ft. of efficiently utilized floor space.

The fabulous, 3-million dollar expansion of Maine Township High will serve the suburbs of Park Ridge and Desplaines. Hinsdale High, a 2-million dollar high school, is for the young folk of famous Hinsdale alone. Who says we are not catching up with schooling needs? That 600 ft. corridor in the Maine Township school sets a standard of architectural design and quality construction never before found in the nation's schools.

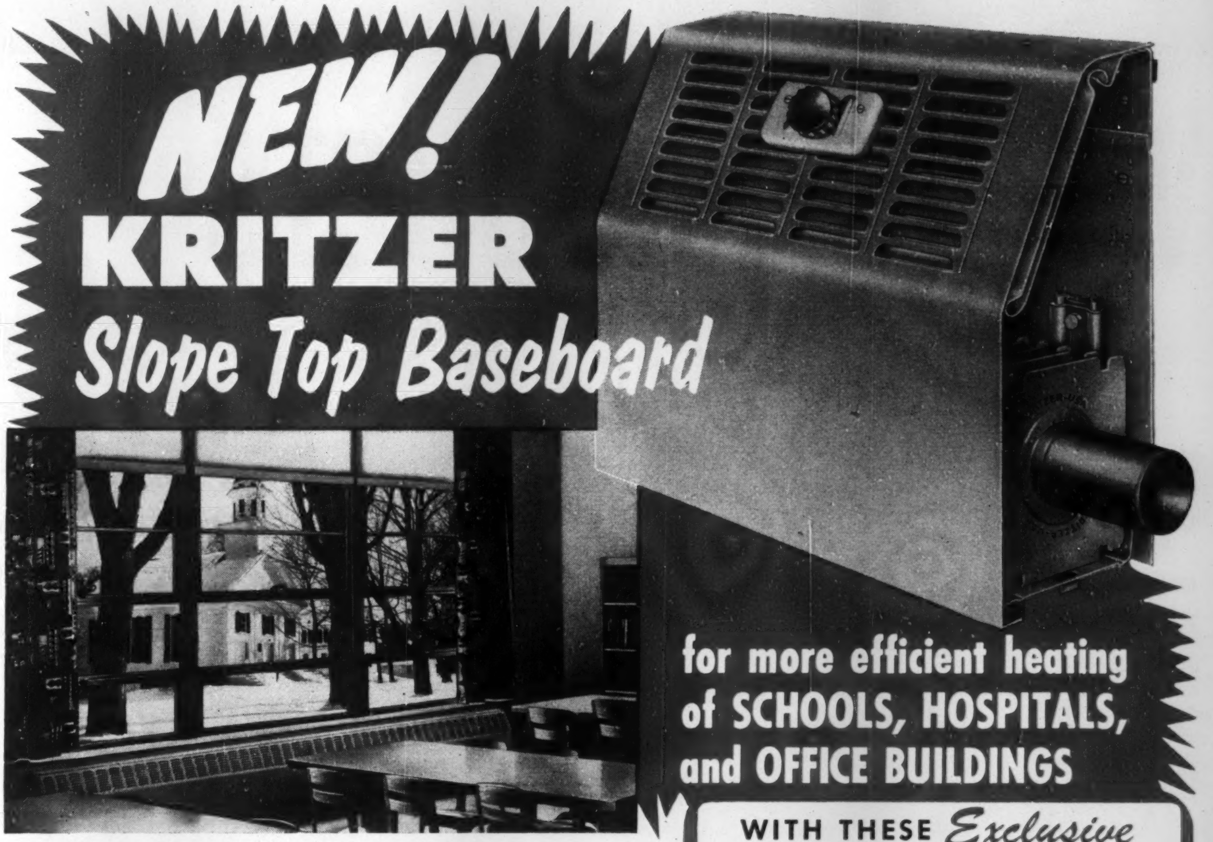
For the best in buildings, the best in heating of course . . . and for the radiators and coils, the best in valves and traps. Hundreds of Marsh Packless Radiator Valves, Radiator Traps and F & T Traps went into the well designed heating systems which involve both direct and indirect radiation.

An excellent example, this — but only one of many examples of the respect for Marsh quality demonstrated on a nationwide scale in the selection of Marsh equipment by foremost architects and contractors. Ask for Catalog 76-H covering the full line of Marsh Heating Specialties.

MARSH HEATING EQUIPMENT CO., *Sales Affiliate of Jas. P. Marsh Corporation* **Dept. T, Skokie, Illinois**

MARSH Heating Specialties SINCE 1865

NEW! KRITZER
Slope Top Baseboard



for more efficient heating of SCHOOLS, HOSPITALS, and OFFICE BUILDINGS

To meet the demand for an attractive, rugged, efficient enclosure for Institutional and Commercial applications, Kritzer presents this new design. The NEW Kritzer Slope Top is a high capacity baseboard made especially for hard-to-heat places where efficiency and durability really count. Its appearance and performance will please everyone.

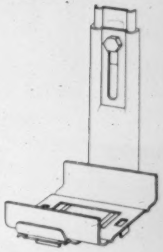
Included in the NEW Slope Top are the exclusive Kritzer features shown at the right which have proved to be of lasting satisfaction to users of other Kritzer Baseboard designs.

Kritzer Certified ratings are a guarantee of satisfactory performance. For further information on the NEW Slope Top Baseboard or any other Kritzer product write to:

Kritzer Radiant Coils, Inc., 2901 Lawrence Avenue, Chicago 25, or:

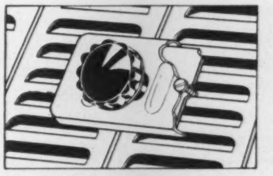
WITH THESE *Exclusive* KRITZER FEATURES

ADJUSTABLE COIL SUPPORT BRACKET



Carries the coil which rides on a self aligning slide cradle. Quiet operation is assured during contraction or expansion of coil.

PATENTED DAMPER and CONTROL



Can be placed at any point along the baseboard. No hinges to bind; no chains to break; no springs to wear out; no holes to drill.

SEE YOUR JOBBER FOR KRITZER PRODUCTS

KRITZER

KRITZER BASEBOARD HEATING • KRITZER FIN-PIPE COILS
KRITZER RADIANT PANEL HEATING

IF IT'S KRITZER, IT'S RIGHT, SIR!

WATTS PRODUCTS

for Water Heating Systems

For heating systems whether by hot water or steam and for domestic hot water supply systems, Watts pioneering research and engineering skill have produced protective and controlling devices that make water heating systems safe, efficient, automatic . . . Watts manufacturing efficiency and excellent workmanship provide you with quality controls, which enable you to render real service to your customers. Protect systems by installing the most advanced controls and safety devices.

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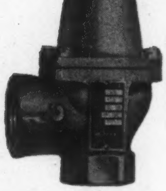

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A.S.M.E.
BOILER SAFETY
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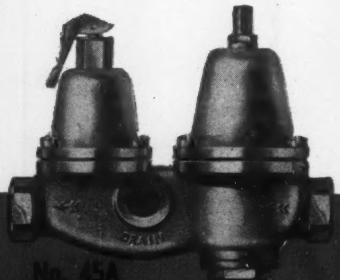

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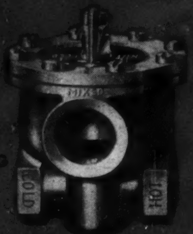
HOT WATER HEATING DUAL CONTROL
De luxe all bronze construction.



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HOT AND COLD
WATER TEMPERING
VALVE.

Series N40
TEMPERATURE AND
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VALVES.

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LOW WATER
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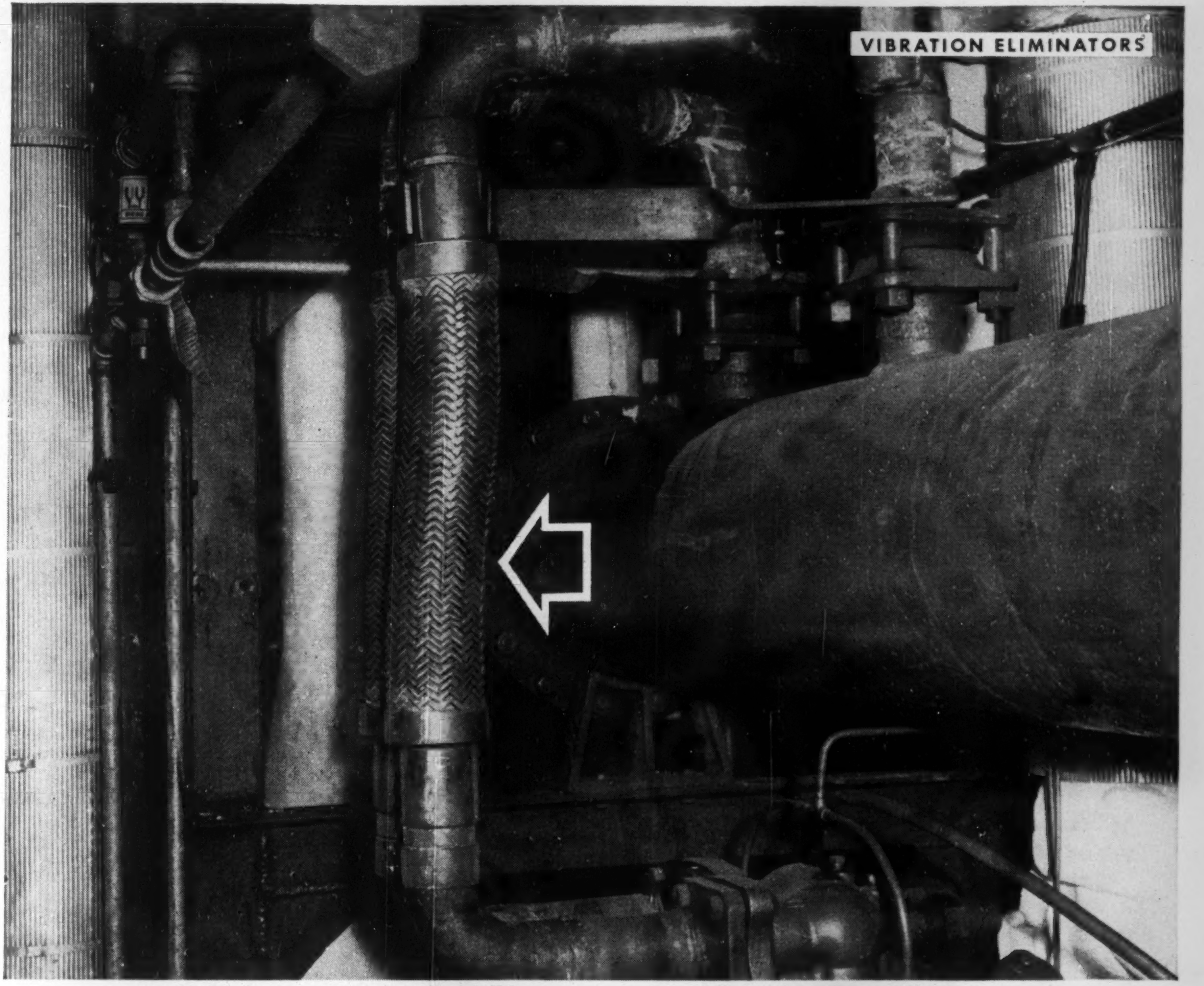
WATTS Regulator Company
LAWRENCE · MASSACHUSETTS



COMPRESSED FREON-22, used to chill brine, is pumped to condenser through two 2½" American Vibration Eliminators. Freon gas returns to compressor through a 3½" American VE (not shown).

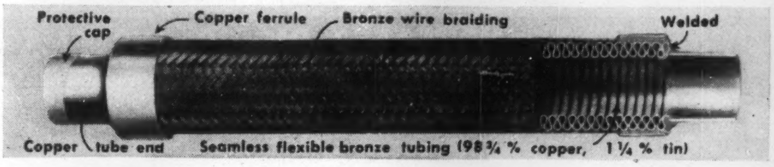
Vibration from 40-hp compressor can't crack this piping protected by American Vibration Eliminators

When you line up a compressor this size—no matter how good the installation—there's sure to be plenty of kick left in it. This unit pounds away at 40-hp and sets up considerable vibration . . . enough to be a menace to rigid refrigerant lines.

Engineers of Hoffmann-La Roche, Inc., Nutley, N. J., manufacturers of pharmaceuticals and vitamins, used two American Seamless Flexible Bronze Connectors — called Vibration Eliminators — to solve the problem here.

These flexible connectors allow for expansion and contraction in rigid lines. They absorb and dampen vibration . . . muffle noise. Refrigerant lines are guarded against fatigue-cracking. American Vibration Eliminators are leakproof, too. That's especially important here, since they carry costly Freon-22 under a working pressure of 210 lb.

Leading wholesalers stock packaged American Vibration Eliminators to fit standard copper tube sizes. For more information, write for Bulletin VE-310R to: *The American Brass Company, American Metal Hose Branch, Waterbury 20, Conn. In Canada: The Canadian Fairbanks-Morse Co., Ltd.* 54227



WHEREVER CONNECTORS MUST MOVE

AMERICAN

flexible metal hose and tubing

an ANACONDA® product

NEVER ENDING LINE OF

Quality

The Ric-wil Company represents over 40 years of manufacturing Quality Insulated piping systems. The complete Ric-wil product line is continuously pre-proven by laboratory and field tests to maintain this superior quality.

Contact your local Ric-wil representative or write direct for Catalog No. 5401.

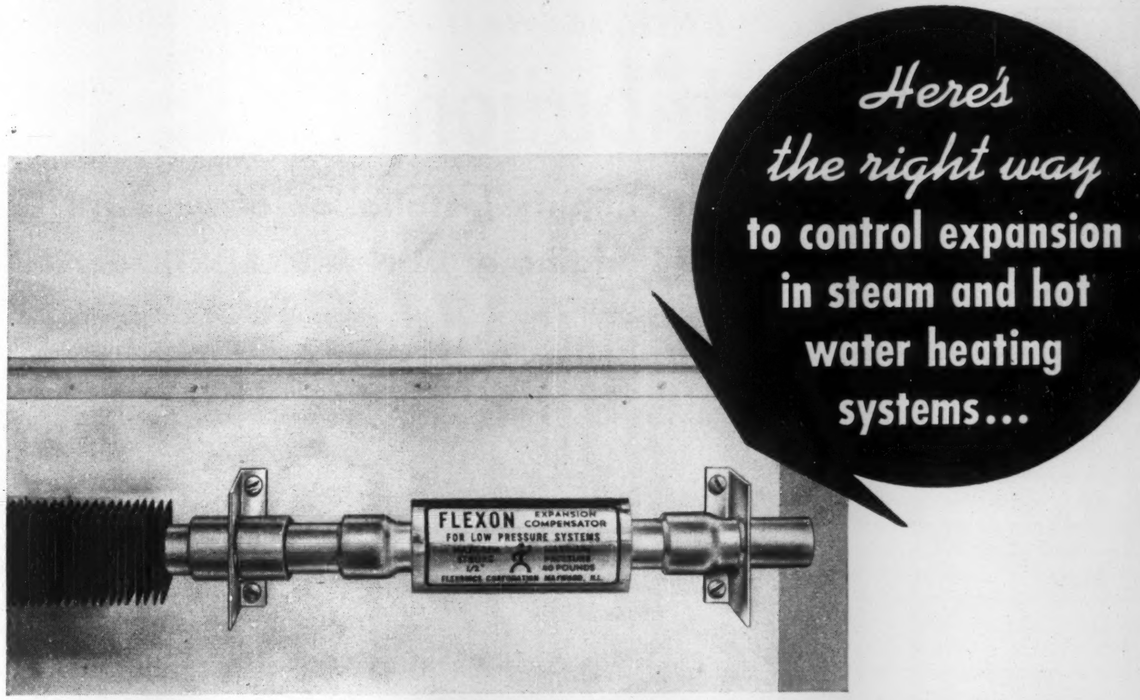
Send for Catalog 5401

RIC-WIL
Insulated Piping Systems

Quality Piping Systems of the . . .
. . . Highest Thermal Efficiency

RIC-WIL PREFABRICATED **INSULATED PIPING SYSTEMS**

THE RIC-WIL COMPANY
BARBERTON, OHIO


FLEXON EXPANSION COMPENSATOR
FOR LOW PRESSURE SYSTEMS
40 POUNDS
FLEXONICS CORPORATION MAYWOOD, ILL.

Here's the right way to control expansion in steam and hot water heating systems...

THE *New* FLEXON EXPANSION COMPENSATOR...

DESIGN DETAILS

EXPANSION
COMPENSATOR
PRESSURE SYSTEMS

The Flexon Expansion Compensator consists of a two ply phosphor bronze bellows with copper tube end connections (sizes ¾" to 1¼") enclosed in a floating protective shroud of brass. All joints are electronically sealed with silver solder for long leak-proof life. The 2" size is especially guided and has standard threaded fittings. A single compensator will handle total piping motion up to ⅝" (½" in compression, ⅛" in extension). Suitable for temperatures from —60° F. to 250° F. and for pressures up to 40 psig.

Control of thermal expansion in low pressure steam and hot water heating systems need not be a headache any longer. The new Flexon Expansion Compensator provides a practical, economical answer to the problem. Designed especially for finned type convectors, baseboard, radiator or heating supply or return lines, the Flexon Expansion Compensator is ideally suited for use in homes, office buildings, schools or any buildings where expansion in heating piping is a problem.

The Flexon Expansion Compensator is practical because it puts an end to leakage that often results from uncontrolled expansion and eliminates objectionable pipe creeping noises. It is economical because it is designed to outlast the building and requires no maintenance whatsoever. Just install it and forget it.

Flexon Expansion Compensators are made in ¾", 1", 1¼" and 2" sizes. Contact your local distributor for further information, or use the coupon below to get your copy of a descriptive bulletin.

Flexonics *Corporation*

Flexon identifies products of Flexonics Corporation that have served industry for over 52 years.

EXPANSION JOINT DIVISION
1391 S. Third Avenue
Maywood, Illinois

Flexonics Corporation
1391 S. Third Ave.
Maywood, Ill.

Please send me the bulletin which describes and gives full specifications for the Flexon Expansion Compensator.

Name ....
Company ....
Address ....
City........................ *Zone*.... *State*............
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BARBER COLMAN

"UNI-FLO" ENGINEERED

Air Distribution

removable cores simplify installation of air diffusers in home office building of DUN & BRADSTREET, INC.

Noteworthy edifice in downtown New York City is this progressive, functional office building at 90 Church Street . . . home of Dun & Bradstreet, Inc. Several years in the planning stages, the resulting structure is complete with the most modern equipment for efficient operation.

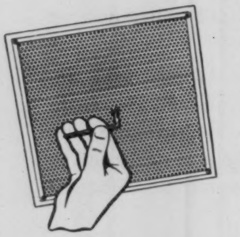
Seven hundred and sixty-nine Uni-Flo Air Diffusers contribute to the comfort of occupants. Easily adjustable to set up air patterns conforming with the building design and needs of the workers, the Barber-Colman equipment brings fresh conditioned air to all offices with minimum noise and maximum efficiency.

Removable cores in sidewall diffusers, plus simple mounting of ceiling diffusers, saved time and effort for the installing contractor. The usual plaster frames were omitted, yet there was no cracked plaster on the job to be patched and repainted.

As a protection for huge investments in air conditioning equipment, more and more owners, architects, engineers, and contractors are specifying the best in air distribution equipment to insure highest efficiency of the entire system. More and more are coming to Barber-Colman Company. Let us show you why.

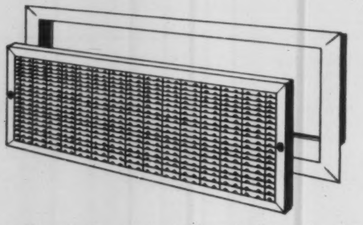
Home office building of Dun & Bradstreet, Inc., 90 Church Street, New York City. Uni-Flo air distribution equipment is installed in office areas from second through eleventh floors. *Architects:* Reinhard, Hofmeister and Walquist. *Consulting Engineers:* Syska & Hennessy, Inc. *Air Conditioning Contractor:* Kerby Saunders, Inc.

Square ceiling diffusers are *adjustable*



Unusually flexible to meet job conditions is this modern Uni-Flo Square Ceiling Diffuser which can be adjusted after installation to provide air deflection from vertical to horizontal and discharge air patterns in one to four directions. Attached to the standard T-bar construction of acoustical ceilings, it harmonizes perfectly with latest ceiling designs. Get Bulletin F-4728-1.

Removable cores also facilitate cleaning of ducts and grilles



Plaster and wall decorations are safe from damage when installing, adjusting, or cleaning Uni-Flo Sidewall Diffusers. Complete core slips in or out with ease—frame has continuous sponge rubber gasket to minimize leakage. 1" lap on frame covers opening irregularities. Get Bulletin F-1415-10.

Uni-Flo Sidewall Diffusers in soffit provide a draft-free, comfortable atmosphere for office workers. Soundly engineered system is easily balanced, quiet and efficient in operation.

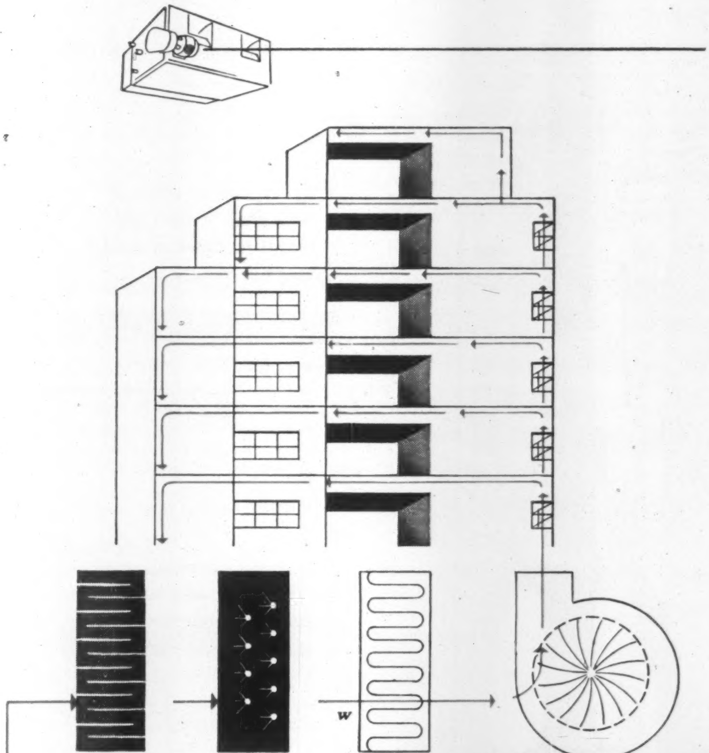
Uni-Flo Square Ceiling Return Grilles mounted in between fluorescent lights, blend gracefully with ceiling.

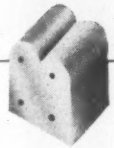
BARBER-COLMAN COMPANY, DEPT. E, 1101 ROCK ST., ROCKFORD, ILLINOIS

Air Distribution Products • Automatic Controls • Industrial Instruments Aircraft Controls • Small Motors • OVERdoors and Operators • Molded Products • Metal Cutting Tools • Machine Tools • Textile Machinery

THE MARK OF
EXTRA DEPENDABLE
REFRIGERATION AND
AIR CONDITIONING EQUIPMENT

ED
ELECTRO DYNAMIC

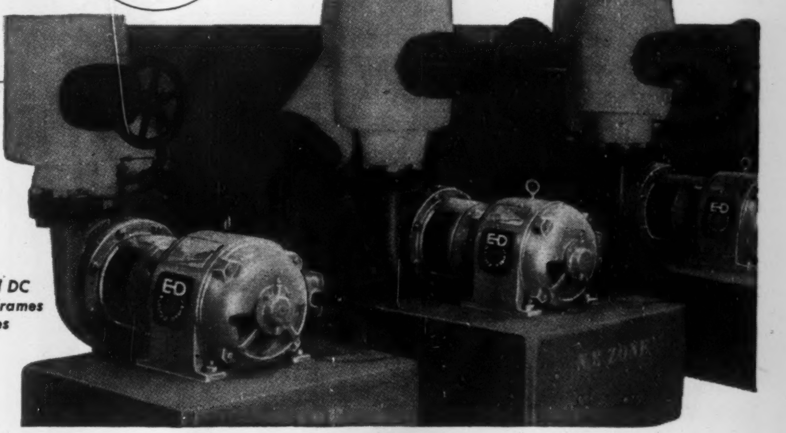




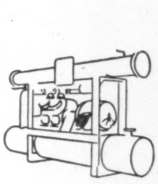
The red "power spot" on refrigeration or air conditioning equipment means *powered by Electro Dynamic,* the most dependable motors *ever* available to industry.

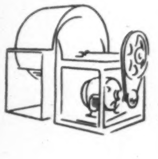
For *proof* of this *extra dependability* send the coupon below for your copy of **"MOTOR SHOWDOWN",** a new candid report on comparative results of motor performance tests* conducted in accordance with A. I. E. E. standards.

*Tests certified by J. Arthur Balmford, Professor of Electrical Engineering at a leading Eastern University.



1 to 250 hp., AC and DC
N. E. M. A. standard frames
All types of enclosures





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MOTOR SHOWDOWN

Please send me a copy of "MOTOR SHOWDOWN" and the new catalog of Electro Dynamic industrial motors.

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for lower cost control of moderately Corrosive fluids

Fig. 2651-A Gate

JENKINS

NICKEL IRON

Valves with Type 316

STAINLESS STEEL

Trim

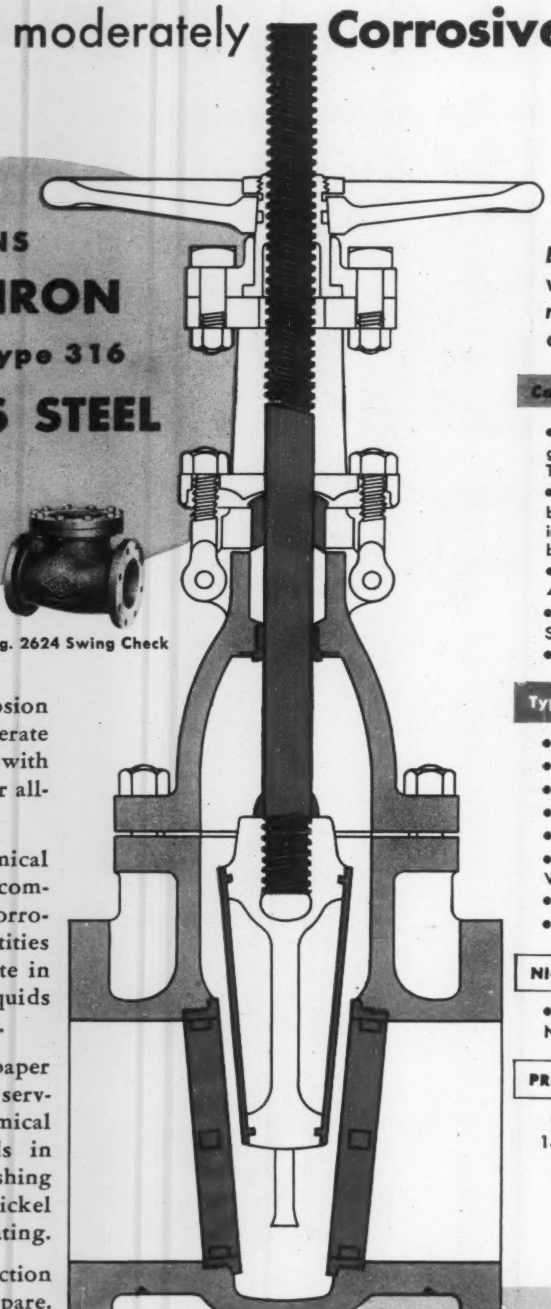


Fig. 2624 Swing Check

Every part in contact with fluid is the right metal to block corrosion and beat wear.

Cast NICKEL IRON

- **BODIES** Heavy duty, dimensioned for greater resistance to wear and abuse. Through port design in Gate Valves.
- **BONNET** Rugged construction, like body. Swing-type gland bolts. Screwed-in back-seating bushing. Deep stuffing box.
- **YOKE** Integral with bonnet in 2″ to 4″ sizes.
- **WEDGE** In 10″ to 24″ sizes, with Stainless Steel Wedge Rings.
- **COVER** In Check Valve.

Type 316 STAINLESS STEEL

- SPINDLE
- GLAND
- BONNET BUSHING
- SPINDLE RING
- WEDGE PIN
- WEDGE RINGS Rolled into Nickel Iron Wedge in 10″ to 24″ sizes.
- SEAT RINGS
- DISC and HANGER in Check Valve

NI-RESIST Type No. 2

- WEDGE of I-beam structure is solid NI-RESIST in 2″ to 8″ sizes.

PRESSURE RATINGS

2″ to 12″—200 lbs. O.W.G.
14″ to 24″—150 lbs. O.W.G.

This combination provides corrosion resistance well above the moderate need in many processing services with an investment well below that for all-stainless steel valves.

Designed primarily for the chemical process industries, they are recommended for control of mildly corrosive liquids with minimum quantities of mineral acids, such as creosote in wood treatment, and many liquids carried in petroleum processing.

A major use is in pulp and paper processing, particularly in lines serving the digester, and in the chemical recovery cycle. Service records in lines carrying the valve-punishing "black liquor" give Jenkins Nickel Iron Valves top performance rating.

Jenkins *extra value* construction throughout. Get details — compare. See why they stretch your valve investment dollar — with longer service life, lower maintenance cost.

ALSO RECOMMENDED for fluids used in electroplating, photograph finishing, bleaching, dyeing, and heat treating of metals.

GET COMPLETE SPECIFICATIONS from your Jenkins Valve Distributor, or write: Jenkins Bros., 100 Park Ave., New York 17. Ask for Bulletin 118.

JENKINS
LOOK FOR THE DIAMOND MARK
VALVES SINCE 1864
TRADE JENKINS MARK
Jenkins Bros

EQUIPMENT DEVELOPMENTS...

Add the new products and companies listed here to your Directory Section which you received in your January 1954 Heating, Piping & Air Conditioning, and thus keep your records of sources of supply up to date throughout the year. Single asterisk indicates equipment not listed in Directory Section; double asterisk, equipment and manufacturer not listed.

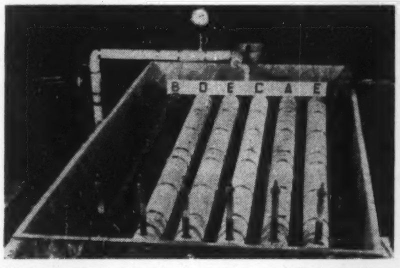
Magnesia Insulation for Hot Piping

A new water resistant insulation has been announced by The Magnesia Insulation Manufacturers Association representing the producers of 85% Magnesia insulation and related products. The new form of 85% Magnesia for hot piping and equipment offers a solution to the problem of insulation damage resulting from severe water exposures.

Exhaustive tests by an independent laboratory, the Association reports, indicate that immersion in boiling water for 378 hours with intermittent drying on hot pipes caused only a slight roughening of the insulation surface with no loss of insulating values. Following the tests, the new product was still in serviceable condition.

The new insulation was developed under the sponsorship of the Technical Committee of MIMA and is the result of several years of research and development in the laboratories and plants of the member companies.

The new insulating material is said to be especially useful for underground pipe lines subject to flooding, process equipment and piping requiring hosing or washing down, and similar conditions.



Test samples ready for immersion and drying. Samples E are the 85 percent Magnesia.

For all practical purposes, the water repellent additive in the new material does not affect the conductivity, density or other vital properties of the insulation. Conventional 85% Magnesia insulation, the Association advises, will continue to be the industry's standard product and the new water resistant material will be offered only where severe moisture problems exist or when specified by the user.

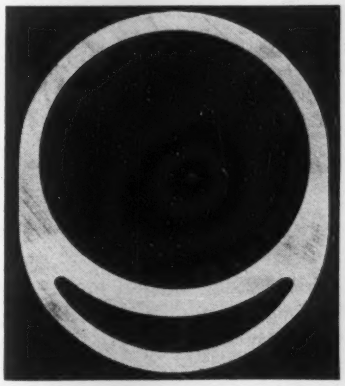
In tests conducted by the Pittsburgh Testing Laboratory, water resistant 85% Magnesia on hot steam pipes was subjected to 30 cycles of immersion in boiling water, each cycle consisting of seven hours immersion and 17 hours drying, plus an additional 168 consecutive hours of immersion. After each immersion, the steam pipes carrying 125 to 140 psig steam dried the insulation thoroughly. Examinations were made between cycles and at the conclusion of the tests for disintegration, cracking, spalling, shrinking or other damage.

At the end of the tests, the new water resistant insulation, according to the laboratory report, was found to be intact with surfaces rougher but with joints firm and in good condition, no appreciable shrinkage, and no swelling or cutting in of bands. The report stated that it "was found to be highly resistant to disintegration under test conditions of continuous steam flow while immersed in boiling water."

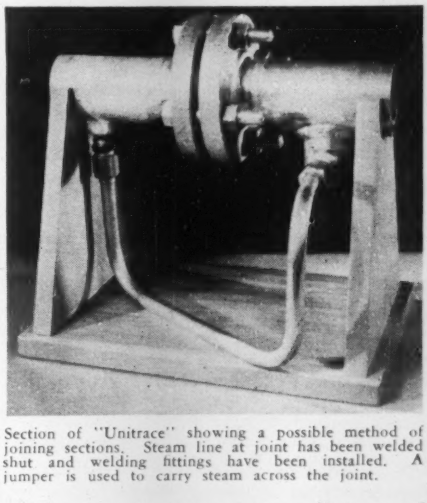
The Magnesia Insulation Manufacturers Association, 420 Lexington Ave., New York 17.

Steam Traced Pipe

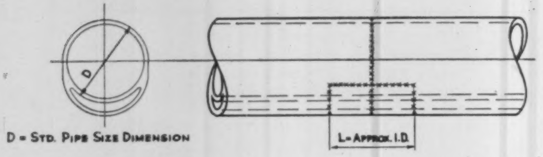
"Unitrace," an integrally extruded steam traced aluminum pipe. . . . It is used for pipes carrying sluggish chemicals which need heat to prevent the products from solidifying or crystallizing in the line. This new pipe is produced so that the steam line is an integral part of the pipe. Extruded as a single unit from "Alcoa" 3S-F aluminum alloy, it is slightly oval in cross section because of the crescent steam passage adjacent to the product line. The size now available has the pipe dimensions of 2 in., Schedule 40. The manufacturer states the piping lends itself to shop fabrication of standard lengths

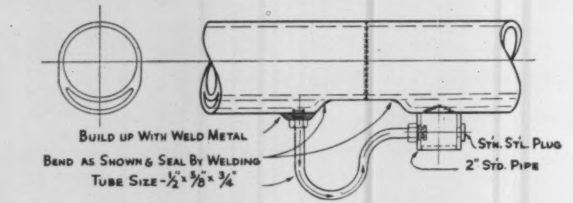


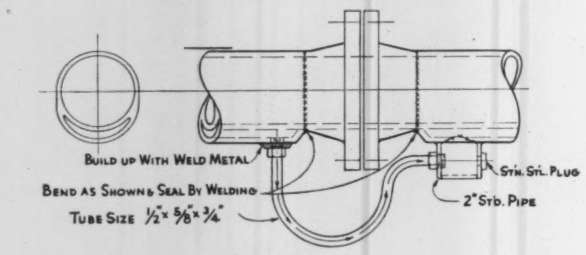
Cross section view of new steam traced piping. Crescent-shaped section at bottom is steam line.



Section of "Unitrace" showing a possible method of joining sections. Steam line at joint has been welded shut and welding fittings have been installed. A jumper is used to carry steam across the joint.







and can be formed using conduit tools. Pre-formed insulation will fit the piping.

Manufacturer—Aluminum Co. of America, 720 Alcoa Bldg., Pittsburgh 19.

Water Chillers

Chillers for use in chilled water air conditioning systems and other liquid cooling applications . . . . Copper inner-fins in refrigerant passages are designed to increase the heat transfer efficiency, while simultaneously permitting smaller size. The chillers have non-ferrous water passages to prevent corrosion problems. The refrigerant side is the single pass type to eliminate any oil trapping problem. Selection of water baffle spacings is available to meet a wide range of water pressure drop requirements, and rock cork insulation is available on all sizes.

Manufacturer—Heat-X-Changer Co., Inc., Brewster, N.Y.

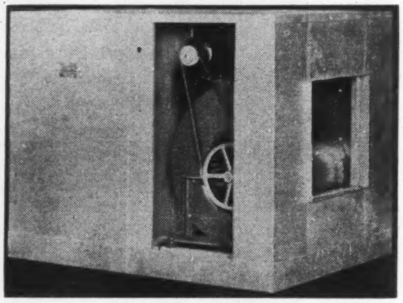
Temperature and Pressure Relief Valves

Calibrated automatic reseating temperature and pressure relief valve for hot water storage heaters . . . . The "Cash-Acme Type RHV" is designed to eliminate the necessity of replacing fusible plugs because of the built in thermostatic element which opens when the water gets too hot and closes after the water has been allowed to cool down. The calibrated spring permits visual adjustment of the relief pressure to various settings up to and including 150 psi without the use of a pressure gage. According to the manufacturer, the revolving head makes it possible to have the pressure setting in the most visible position. The valve is available with or without a lever.

Manufacturer—A. W. Cash Valve Mfg. Corp., 666 E. Wabash Ave., Decatur, Ill.

Evaporative Cooler

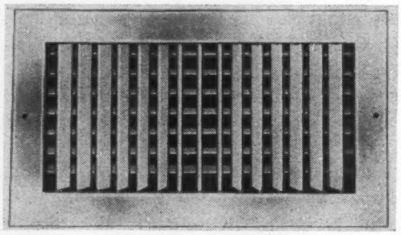
Rotary spray type evaporative cooler for commercial and industrial applications . . . . In operation, the air entering the cooler intake is pulled through a fine atomized water spray where it is partially cooled and washed. Next the air is pulled through the first of two sets of pads, which is the evaporative pad where the cooling process takes place. The air then passes through the second pad, which removes any moisture that may be entrained in the air stream. After this, the air enters the blower and is then discharged. The spray unit is a perforated slinger wheel connected to a motor mounted in a waterproof compartment.



Manufacturer—Hayes Furnace Mfg. and Supply Co., 2929 S. Fairfax Ave., Los Angeles 16.

New Line of Registers and Grilles

**New firm has begun production of a complete line of adjustable type registers, grilles and accessories for central plant cooling and ventilating systems . . . . The line is fabricated mainly of hollow-rolled metal sections assembled in welded rectangular frames. Also included are stamped plain lattice and ventilating grilles. Feature of all types of registers is the "Silentite" volume damper of the opposed-action valve type with blades of hollow ribbed construction. Accessories include duct air directors, adjusting keys, mounting frames and fusible links.



Manufacturer—General Register Corp., 14 Factory St., Cedar Grove, N.J.

Titanium Diaphragm Control Valve

Large titanium and silver diaphragm control valve, one of two recently designed and manufac-

NEVER Ventilate a Ceiling or Wall Space to the Inside...

If you do, the better the insulation, the worse will be the condensation; for the colder the air in the space between insulation and roof, or walls, the less vapor can it support.

In new construction, moisture is evaporating from many tons of cement and plaster. Vapor flows from areas of greater density into this small, cold space, an area of less vapor density and small vapor capacity.

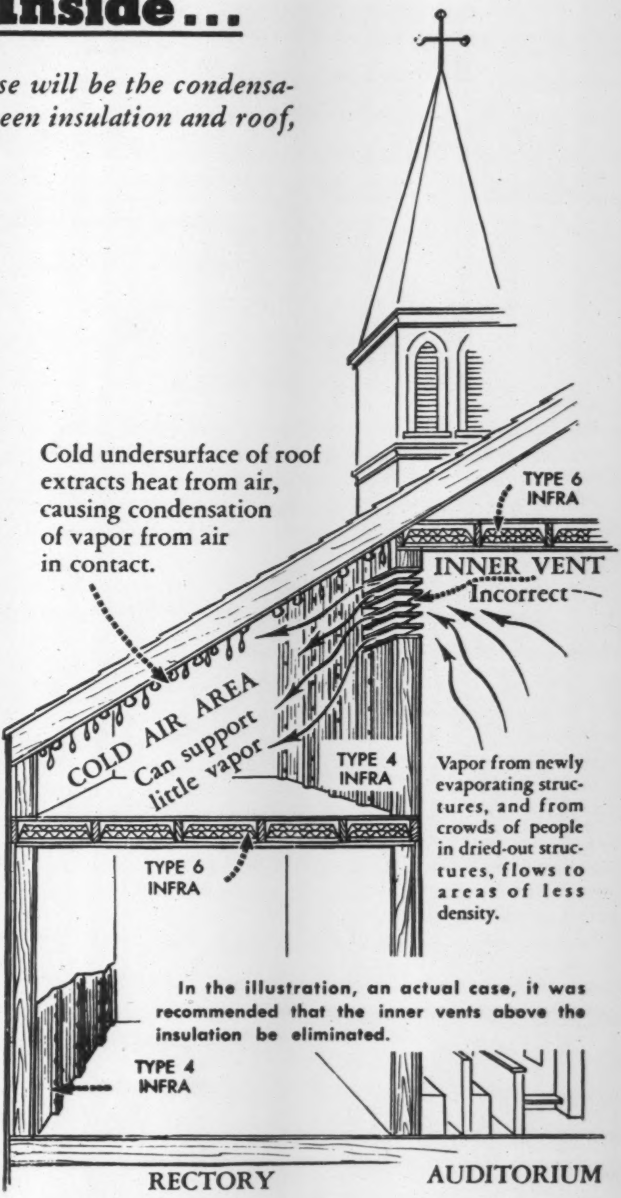
Where multiple accordion aluminum is used, fortuitous vapor and water (for instance rain) will gradually flow out, as vapor, through exterior walls and roofs as vapor pressure develops within. The vapor cannot back up through the continuous, impervious aluminum. It will flow out because walls and roofs have substantial permeability, by comparison far greater than the required 5:1 ratio. Infiltration under the flat stapled flanges of multiple accordion aluminum is slight.

Unusual amounts of vapor, as from crowds in theatres, churches, schools, stores, etc. must be adequately vented to the outside.

The new multiple accordion aluminum* Infra Types 6-S*i* and 4-S*i* forms a continuous blanket of uniform thickness between joists, giving the entire area maximum protection against heat loss and condensation formation. Write for samples.

The U. S. National Bureau of Standards has prepared a helpful and informative booklet, "Moisture Condensation in Building Walls" which discusses causes and cures. Use the coupon and we will send a free copy.

*Patent applied for



Cold undersurface of roof extracts heat from air, causing condensation of vapor from air in contact.

Vapor from newly evaporating structures, and from crowds of people in dried-out structures, flows to areas of less density.

In the illustration, an actual case, it was recommended that the inner vents above the insulation be eliminated.

COST OF INFRA INSULATION INSTALLED in new construction between wood joists, material with labor,

Type 6-S*i* under 9½¢ sq. ft.
Type 4-S*i* under 7½¢ sq. ft.

INFRA INSULATION INC. Dept. H-5
525 Broadway, New York, N. Y.
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☐ Please send samples
Name__________
Firm__________
Address__________

INFRA INSULATION, INC., 525 Bway., New York, N. Y. WOrth 4-2241

tured to handle high pressure service of a highly corrosive fluid . . . . The trim of this valve was machined from

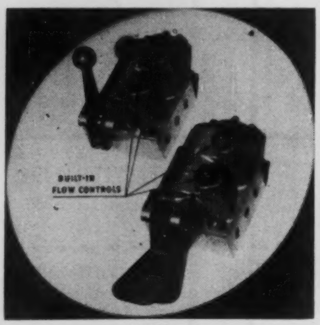
solid titanium. The company states that under severe operating conditions it will last approximately 70 days before requiring replacing. The silver lining, 3/32 of an in. thick, was inserted in the inlet bore to give increased body life. To further offset corrosion, the bore was made ½ in. smaller than usual.

Manufacturer—Minneapolis-Honeywell Regulator Co., Valve Div., 2641 4th Ave. S., Minneapolis 8, Minn.

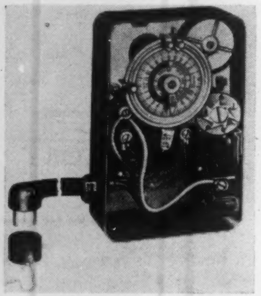
Time Control for Air Conditioners

Portable plug-in time switches designed for automatic control of 1/3, 1/2, 3/4 or 1 hp room air conditioners . . . . Known as "Series P690" of the "Inter-Matic" time switch line, they are equipped with a 4 ft, 14 gage, 3 wire, type "S" cord set with molded rubber, three-way, grounded male plug. Two models are available for 125 or 250 volt operation. It may be set for 11 on-off operations a day. Timing range is 1 to 23 hr. A skipping device provides for stopping the automatic operation on holidays and weekends.

Manufacturer—International Register Co., 2624 W. Washington Blvd., Chicago 12.



Valve



Time Control

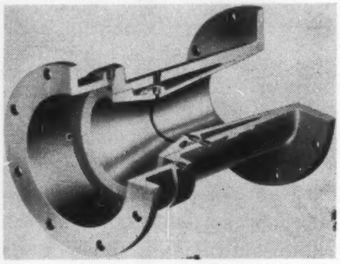
Four-Way Valve

An air and low pressure hydraulic valve, specifically designed for the control of double acting air or hydraulic cylinders . . . . It is a hand and foot operated four-way valve with patented built in, full capacity, flow control meters of the venturi type. The valves feature one balanced spool using renewable "O" ring type packing. The flow control meters are designed to permit full line volume without loss of pressure. According to the manufacturer, line pressure variation will not affect valve function. The valve is available in four standard pipe sizes —¼, ⅜, ½ and ¾ in.—for air, oil or water, in a pressure range of 0-150 lb.

Manufacturer—Airmatic Valve, Inc., 7317 Associate Ave., Cleveland 9.

Flow Tube for Liquid Measurement

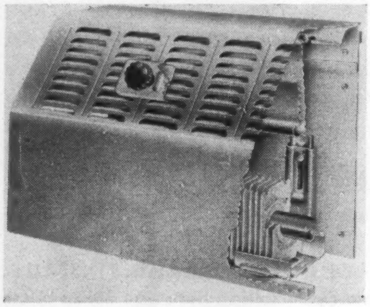
"Dall Flow Tube" for metering liquids and gases . . . . It is designed for use with gases and liquids carrying no settleable solids. It consists of a short, flanged, cylindrical body designed with an abrupt decrease in diameter, followed by a conical restriction and diverging outlet. The reduced area at the cone entrance together with the design of the annular throat induces the high differential pressure obtained. The diverging outlet cone provides the recovery of differential pressure. One of the features, according to the company, is low permanent head loss.



Manufacturer—Builders-Providence, Inc., 345 Harris Ave., Providence 1, R. I.

New Baseboard Design

New high capacity baseboard with slope top design for greater radiation . . . It is fabricated from automobile gage steel with louvered front and is covered with a corrosion resistant finish. Features include a patented damper and control; adjustable coil support bracket, and slide cradle. The damper is mechanically suspended from the baseboard frame. It uses no springs, chains or hinges. According to the manufacturer, the damper control will operate from any point in the baseboard run. When placed in position and engaged with the damper, two set screws hold the control in place.

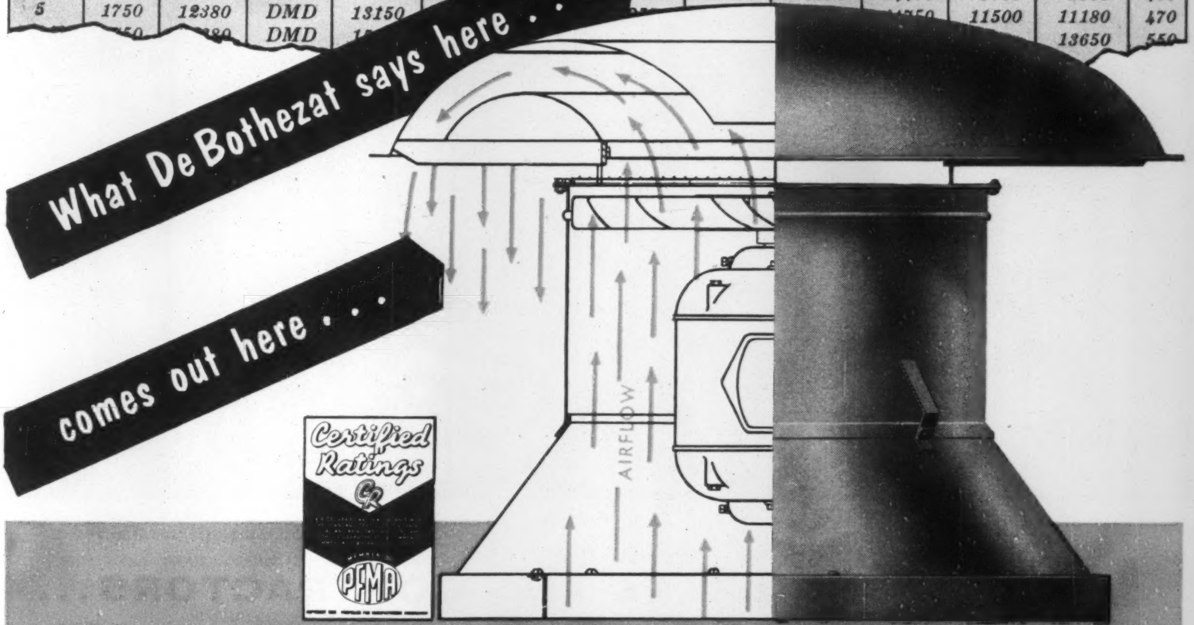


Manufacturer—Kritzer Radiant Coils, 2901 Lawrence Ave., Chicago 25.

[*Continued on page* 246]

TABLE OF CERTIFIED CAPACITY RATINGS

Motor HP	Fan RPM	Tip Speed	Drive	SP 0"	SP 1/8"	SP 1/4"	SP 3/8"	SP 1/2"	SP 5/8"	SP 3/4"	SP 7/8"	SP 1"	Net Wt.
1	1140	8060	DMD	7125	6750	6350	5900	5375	4800	4150	3500	2750	352
1-1/2	1140	8060	DMD	9400	9100	[illegible]	[illegible]	7750	7175	6200	3850	3400	395
2	1140	8060	DMD	10200	[illegible]	[illegible]	[illegible]	8575	8075	4450	3600	2900	400
5	1750	12380	DMD	13150	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	11500	11180	470
[illegible]	[illegible]	[illegible]	DMD	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	13650	[illegible]



GET ALL THE AIR YOU PAY FOR

. . . RIGHT NOW!

Next time you buy or specify roof ventilators, consider their cost in terms of CFM. And for your own protection, ask the manufacturer how he arrives at ventilator capacity ratings.

DeBothezat capacity ratings are the output of the completely assembled roof ventilator, *including the head*. These ratings are obtained from wind tunnel tests conducted in accordance with NAFM Standard Test Code Bulletin number 110, Plate VIA. They conform with U. S. Dept. of Commerce Standard 178-51, which embodies the test codes of ASHVE, NAFM and PFMA.

WHY WAIT?

All members of the Power Fan Manufacturers Association have agreed to begin rating their roof ventilators this way within the next twelve months. You don't have to wait, though. DeBothezat Power-Flow Roof Ventilators are already so rated, and have been for years. Specify DeBothezat NOW and get all the air you pay for.

DeBothezat

Send for free catalog . . .

DeBOTHEZAT FANS DIVISION
American Machine and Metals, Inc.
Dept. HPAC-554, East Moline, Illinois

Send Catalog DR-3-53 containing certified ratings and complete data on Power-Flow Roof Ventilators.

FIRM NAME ________________

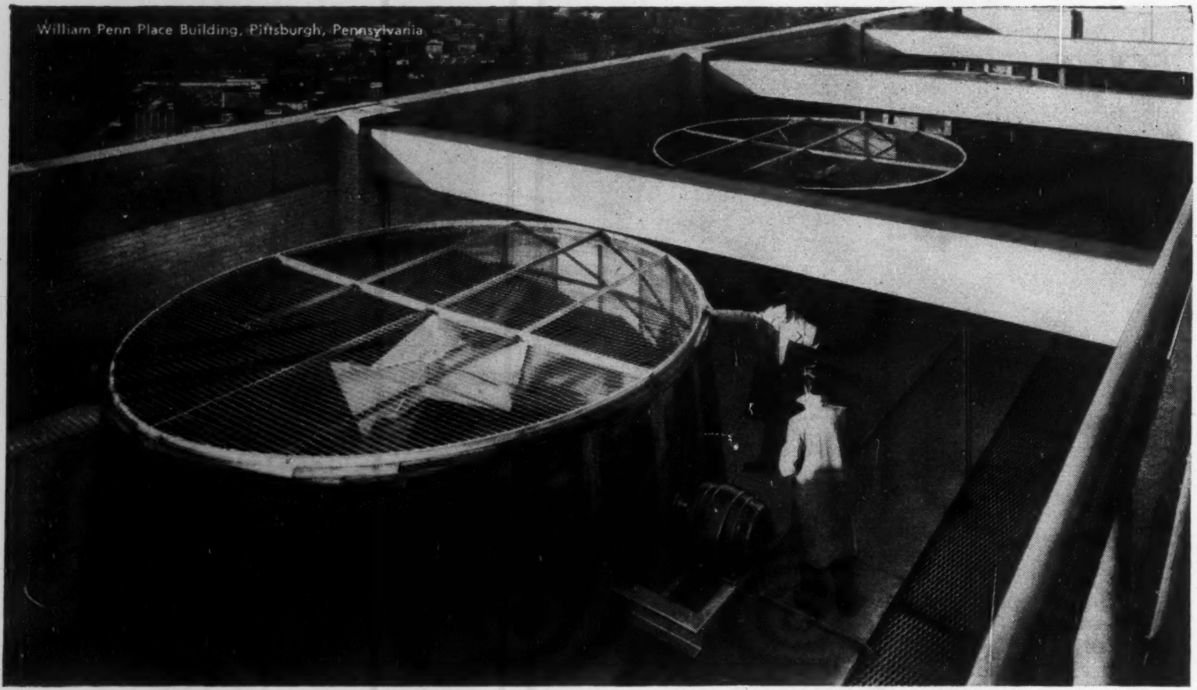
ADDRESS ________________

CITY ________ ZONE ____ STATE ________

NAME AND TITLE ________________

DeBothezat Fans

Division of American Machine and Metals, Inc.
EAST MOLINE, ILLINOIS


William Penn Place Building, Pittsburgh, Pennsylvania

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... demand the best! That's why they depend on Pritchard for the proper solution to comfort cooling problems. For 28 years, Pritchard has demonstrated its exceptional qualifications to coordinate architectural treatment, mechanical equipment, engineering skill and modern construction methods into outstanding cooling tower installations.

Pritchard is a founder member of the Cooling Tower Institute . . . has the long experience necessary to assist you in selecting the *right* tower for your client's needs, the proved ability to design and construct the tower that will meet their operating requirements. You can be absolutely certain of that because Pritchard *unconditionally guarantees* the performance of its towers. Economical, efficient operation is assured because Pritchard towers are thoroughly engineered for adequate capacity and will conserve up to 99% of the water for re-use.

For complete information, contact your nearby Pritchard representative listed in the classified section of your telephone directory, or write direct to Pritchard's General Offices, Kansas City, Mo.

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Cooling Towers
Specialized Heat Exchangers
Gas and Air Treating Equipment
Construction and Processing Facilities

J. F. Pritchard & Co.
ENGINEERS • CONSTRUCTORS • MANUFACTURERS

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DISTRICT OFFICES: CHICAGO • HOUSTON • NEW YORK
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Representatives in Principal Cities from Coast to Coast

Do you cut these materials in your plant?

BRASS
ALUMINUM SHEETS AND EXTRUSIONS
COPPER
LEAD
STAINLESS STEEL
CAST IRON
STEEL SHEETS AND SHAPES

Then "SKIL has the answer"!

. . . with 9 High Torque Extra Heavy Duty SKIL Saws, 3 High Blade-Speed, Light Weight, Heavy Duty Builders Saws.

. . . with 98 Specially Designed Stock Blades and Cut-Off Wheels to Cut Almost Any Material You Can Name!

. . . to Handle More Cutting Jobs Economically with Greater Money and Labor Saving than Ever Before.

SAVE in initial equipment cost. No expensive band saws, power shears or other heavy, stationary equipment.

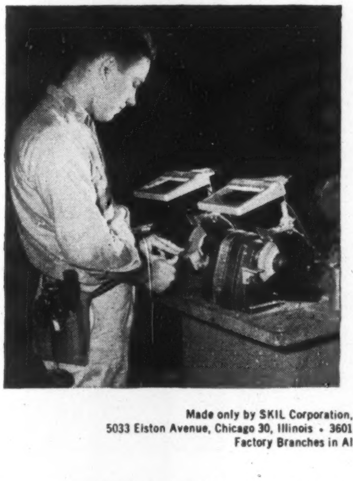
SAVE in material handling — save both equipment and labor. No need to move bulky material to machine. Take SKIL Saw to stock room or warehouse.

SAVE by eliminating inventory of special blades or cut-off wheels. Standard SKIL blades or wheels handle most jobs and are available quickly from your distributor.

***FREE!* New SKIL Blade Selector** to help you solve cutting problems. Shows the blade and SKIL Saw to cut practically every material used in production and plant maintenance. Ask your SKIL distributor or send coupon.

***FREE!* Test Cutting Service** on your problem materials. Send us samples of materials and details of any cutting problems in your plant. We'll let you know the SKIL Saw and blade to answer your problem.

Two New SKIL 6" Bench Grinders save steps . . . speed production



Carrying tools or work to distant bench grinders is a "bottleneck" you can break by spotting several of the new 6" SKIL Bench Grinders in strategic locations. Features: safety indicator light; removable wheel guards, covers; adjustable spark arrestors, tool rests; built-in dust exhaust chutes.

SKIL
SAW & BLADE SELECTOR

***FREE!* Ask for a Demonstration and a *FREE* Trial of the SKIL Saw with the exact SKIL BLADE or CUT-OFF wheel to solve your toughest cutting problem.**

SKIL
PORTABLE TOOLS

SKIL Corporation, Dept. HPA-54
5033 Elston Avenue, Chicago 30, Illinois

☐ I would like a SKIL Blade Selector
☐ I would like a demonstration and free trial
☐ Please send literature on SKIL tools

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Company____________________
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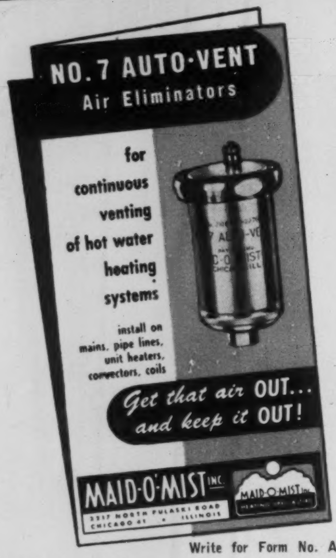
Made only by SKIL Corporation, formerly SKILSAW, Inc.
5033 Elston Avenue, Chicago 30, Illinois • 3601 Dundas Street West, Toronto 9, Ontario
Factory Branches in All Leading Cities

They cost no more . . . So why settle for less!

THE BEST AUTOMATIC AIR VALVES FOR EVERY HOT WATER HEATING JOB ARE LABELED . . .

MAID-O'-MIST AUTO-VENT®



NO. 7 AUTO-VENT
Air Eliminators

for continuous venting of hot water heating systems

install on mains, pipe lines, unit heaters, convectors, coils

Get that air OUT... *and keep it* OUT!

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CHICAGO 41 • ILLINOIS

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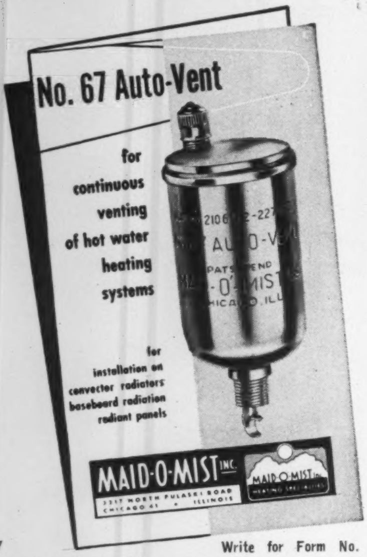

No. 67 Auto-Vent

for continuous venting of hot water heating systems

for installation on convector radiators baseboard radiation radiant panels

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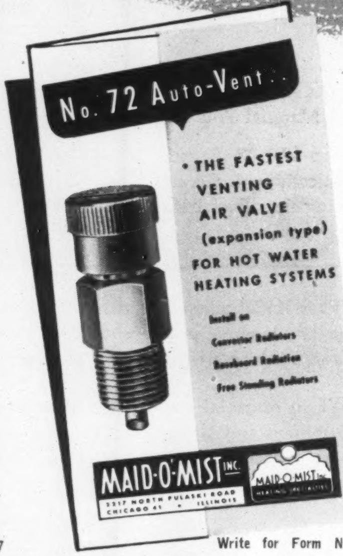

No. 72 Auto-Vent . .

• THE FASTEST VENTING AIR VALVE (expansion type) FOR HOT WATER HEATING SYSTEMS

Install on
Convector Radiators
Baseboard Radiation
Free Standing Radiators

MAID-O-MIST INC.
3217 NORTH PULASKI ROAD
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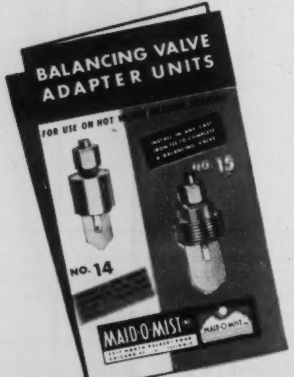
Write for Form No. 72

The Envelope Stuffers illustrated above are designed for your use. When ordering copies, please give the Form No. as listed under each folder.

MAID-O'-MIST® ADAPTER UNITS CONVERT STANDARD TEES INTO BALANCING VALVES



BALANCING VALVE ADAPTER UNITS

FOR USE ON HOT

INSTALL IN ANY CAST IRON TEE TO COMPLETE A BALANCING VALVE

NO. 15

NO. 14

MAID-O-MIST INC

Write for Form No. 1415

Maid-O'-Mist offers you a low cost unit for making up your own balancing valves. They are designed for the job of balancing hot water heating systems . . . easy to install . . . and priced much lower than square head cocks or other types of shut-off valves. These Adapter Units are quickly soldered or sweat fitted into regular copper or bronze tees, or threaded into cast iron tees. Can be inserted in side outlet or run of tee of the same pipe size to complete either a straightway or angle balancing valve. Simple balancing adjustment requires only a screwdriver. Precision made of brass and monel metals with packed stem construction.

FULL FREE FLOW OF WATER THROUGH THE TEE. Since there is no inside reduction of pipe diameter, there is no water restriction except for the balancing required. This advantage plus low cost permits the use of additional balancing in a hot water system without preliminary planning.

MAID-O'-MIST Inc.
HEATING SPECIALTIES

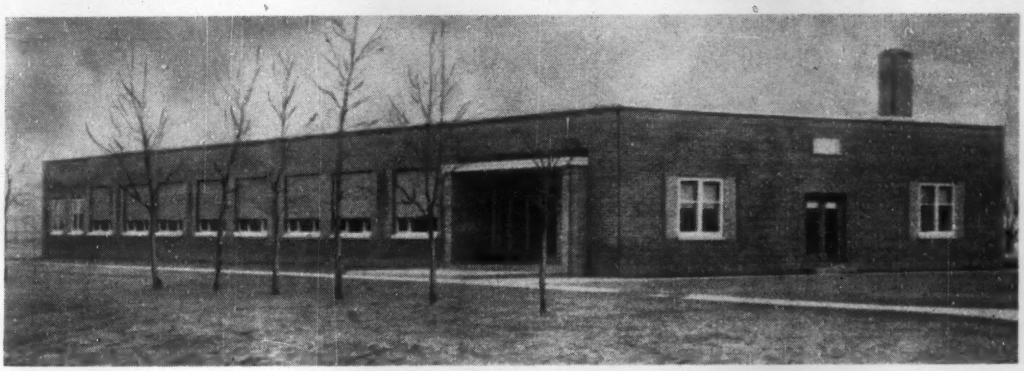
AUTOMATIC HUMIDIFIERS . . . . . AUTO-VENTS
WATER LINE CONTROLS . HEATING SPECIALTIES

MAID-O'-MIST, Inc.

3217 NORTH PULASKI ROAD . CHICAGO 41, ILL.

WARM AIR HEATED...

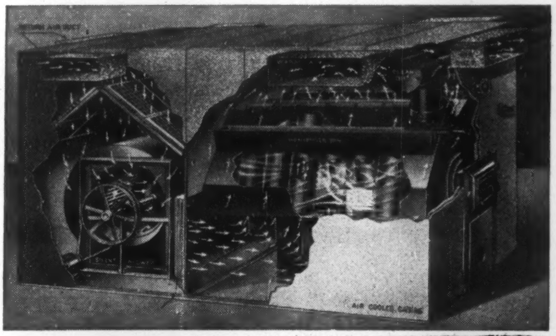
by Campbell



School building, Tolna, North Dakota, heated with a Campbell No. 8100 Stoker-fired Heater with PerimetAir distribution. Installed in 1950. Wells & Denbrook, architects, Grand Forks, N. D.

FOR LOW COST SCHOOL HEATING

Low in first cost — low in operating costs — Campbell 8000 Heaters make warm air heating of large multi-room buildings both easy and practical. Large silent blower assures quick, efficient distribution of heat. Positive control of temperature, humidity and ventilation. Easily installed. Available for all fuels in capacities up to 3,000,000 BTUs.



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We have a number of attractive openings for manufacturers' agents who call on heating contractors and architects. If interested, please state territory you cover.

CAMPBELL HEATING CO.
Des Moines 17, Iowa
I am interested in your proposition for manufacturers' agents.
My territory covers..
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ADDRESS..
CITY..........................ZONE.....STATE......

CAMPBELL HEATING COMPANY

Des Moines 17, Iowa

GRABLER

SQUARE "GEE" PIPE HANGERS

Are Time-Cost Saving Tools

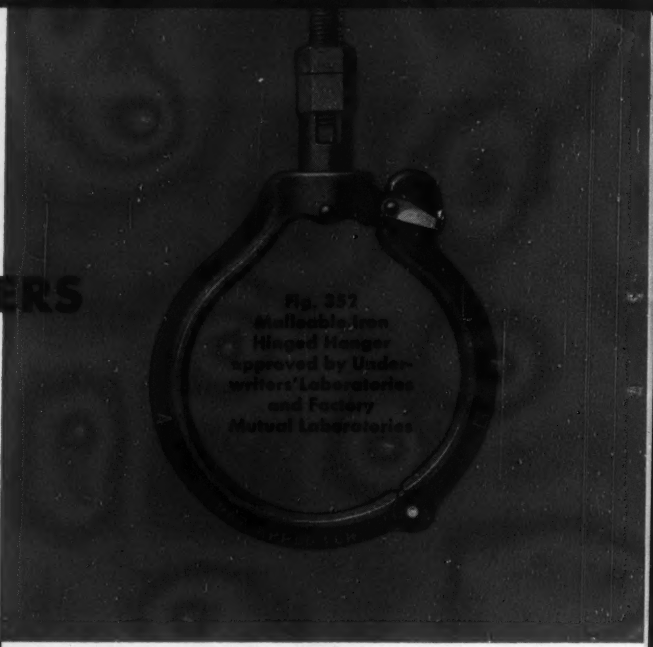

Fig. 357
Malleable Iron
Hinged Hanger
approved by Underwriters' Laboratories
and Factory
Mutual Laboratories

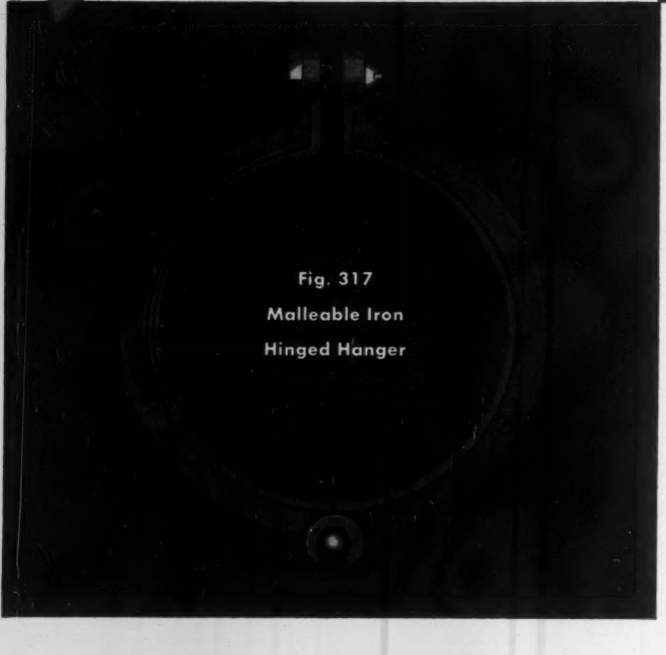

Fig. 317
Malleable Iron
Hinged Hanger

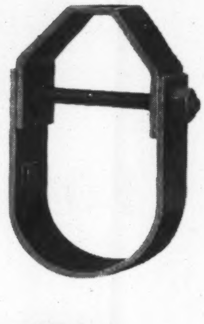

Fig. 97
Steel Clevis
Approved by
Underwriters'
Laboratories and
Factory Mutual
Laboratories

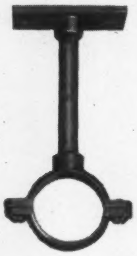

Fig. 65
Split Ring Hanger
with
Nipple and Plate

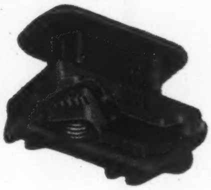

Fig. 315
Concrete Insert Approved
by Underwriters'
Laboratories and Factory
Mutual Laboratories

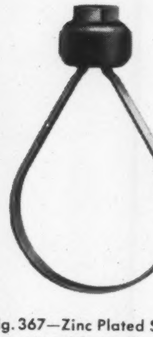

Fig. 367—Zinc Plated Steel
Hanger with Malleable
Nut, Approved by Underwriters' Laboratories and
Factory Mutual
Laboratories

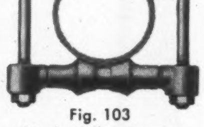

Fig. 103
Single Roller Hanger

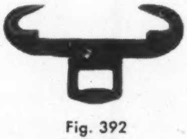

Fig. 392
Malleable
Iron Adjustable,
I Beam Clamps

CHECKING YOUR TIME-COSTS can reveal important assembly and installation cost reductions when Square "GEE" Pipe Hangers are used.

You will discover that Grabler Square "GEE" Pipe Hangers are time-cost saving tools—tools that can give relief from time-wasting grief on your next plumbing and heating job. Square "GEE" Pipe Hangers are designed, fabricated and tested to comply with modern engineering and construction practices. Ask your wholesaler for Grabler Square "GEE" Pipe Hangers.

THE SQUARE "GEE" LINE INCLUDES:

Malleable Fittings, AAR Fittings, Unions, Rail Fittings, Cast Iron Steam Fittings, Cast Iron Drainage Fittings, Patented Drainage Fittings, Copper Tube Solder-Joint Fittings, Cast Brass Solder-Joint Drainage Fittings, Steel Pipe Nipples, Hangers.

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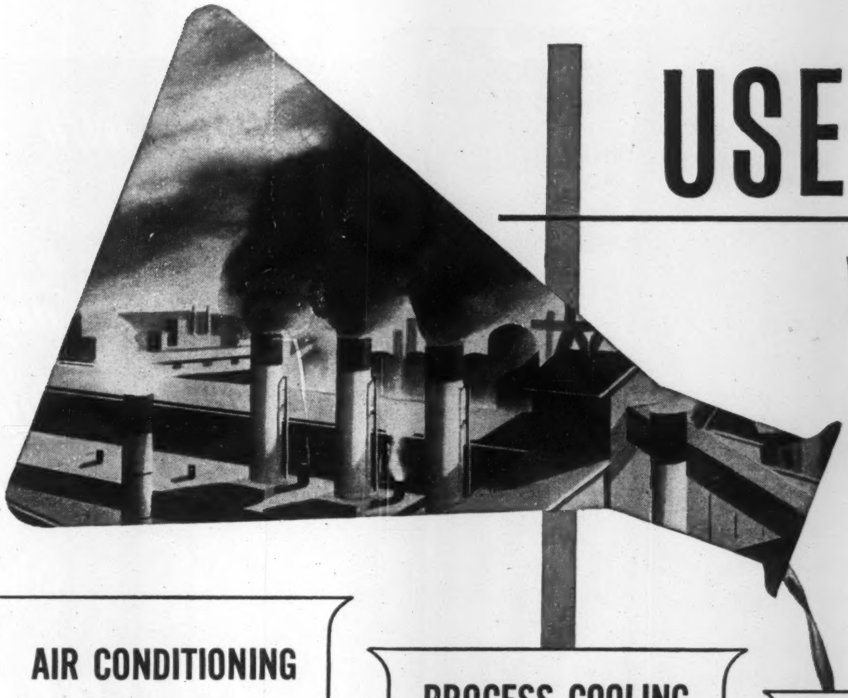
USE

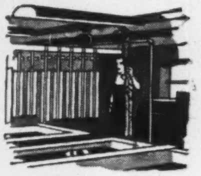
WASTE HEAT!



AIR CONDITIONING

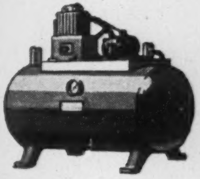
Let the adaptable Servel 25-ton Water Chiller convert waste heat, or steam from any source, into lowest cost air conditioning for your plant and offices!

PROCESS COOLING

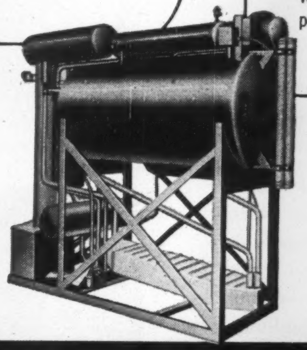


Use the cheapest energy source—even waste heat—to achieve high-efficiency cooling for manufacturing processes! Servel Water Chiller operates on dependable absorption principle.

INDUSTRIAL PRECOOLING



Increase capacity and improve performance of air compressors and internal combustion machines! The Water Chiller is compact, light; can be safely installed on almost any floor.



The Servel Water Chiller cooling system has no moving parts to wear. It is quiet and vibration-free. Light floor loading and freedom from vibration mean that no special foundations or braces are needed. Zone control is unusually easy. And operation (using waste heat, or steam from the cheapest source) is low in cost. Backed by a 5-year warranty. See your dealer or mail coupon for information and engineering co-operation.

Servel

the name to watch for great advances in

AIR CONDITIONING ✓ REFRIGERATION

SERVEL, INC., Dept. HP-54 Evansville 20, Indiana

Please send me complete information on Servel equipment for
☐ Air Conditioning, ☐ Process Cooling, ☐ Industrial Precooling.

Name______________________________

Firm______________________________

Address____________________________

City________________County________State______

modern

in design... with modern air conditioning equipment by Marlo

Air Conditioning and Heating Contractor:
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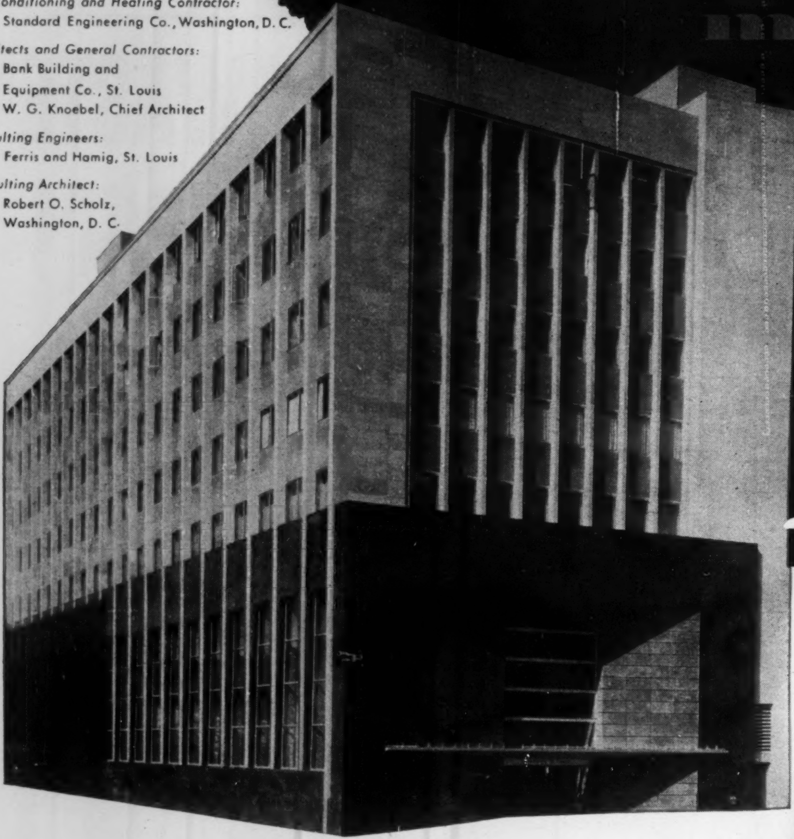
Architects and General Contractors:
Bank Building and
Equipment Co., St. Louis
W. G. Knoebel, Chief Architect

Consulting Engineers:
Ferris and Hamig, St. Louis

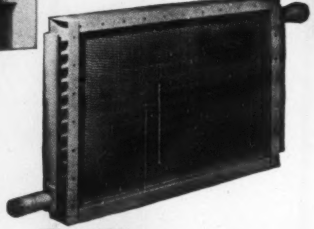
Consulting Architect:
Robert O. Scholz,
Washington, D. C.



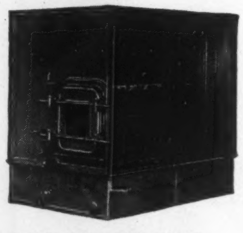
Every detail of this handsome structure in Washington, D. C., was planned to achieve the utmost in beauty, efficiency and luxurious comfort. It is the new home of the Perpetual Building Association.

Year-round air conditioning, of course, is an important feature of the progressive merchandising techniques which have made this 73-year-old company the leader in its field. Marlo Spray Type Dehumidifiers, Marlo Steam Coils and Marlo Water Coils perform a vital service in the winter-summer comfort-conditioning system serving this modern building.

In the complete line of quality Marlo equipment, you'll find the answer to any air conditioning problem. Marlo will be glad to give you complete details. Write today.



STEAM COIL



SPRAY TYPE DEHUMIDIFIER

Marlo

COIL COMPANY

Manufacturers of COOLING TOWERS • EVAPORATIVE CONDENSERS • INDUSTRIAL COOLERS • AIR CONDITIONING UNITS • MULTI-ZONE UNITS • BLAST HEATING & COOLING COILS

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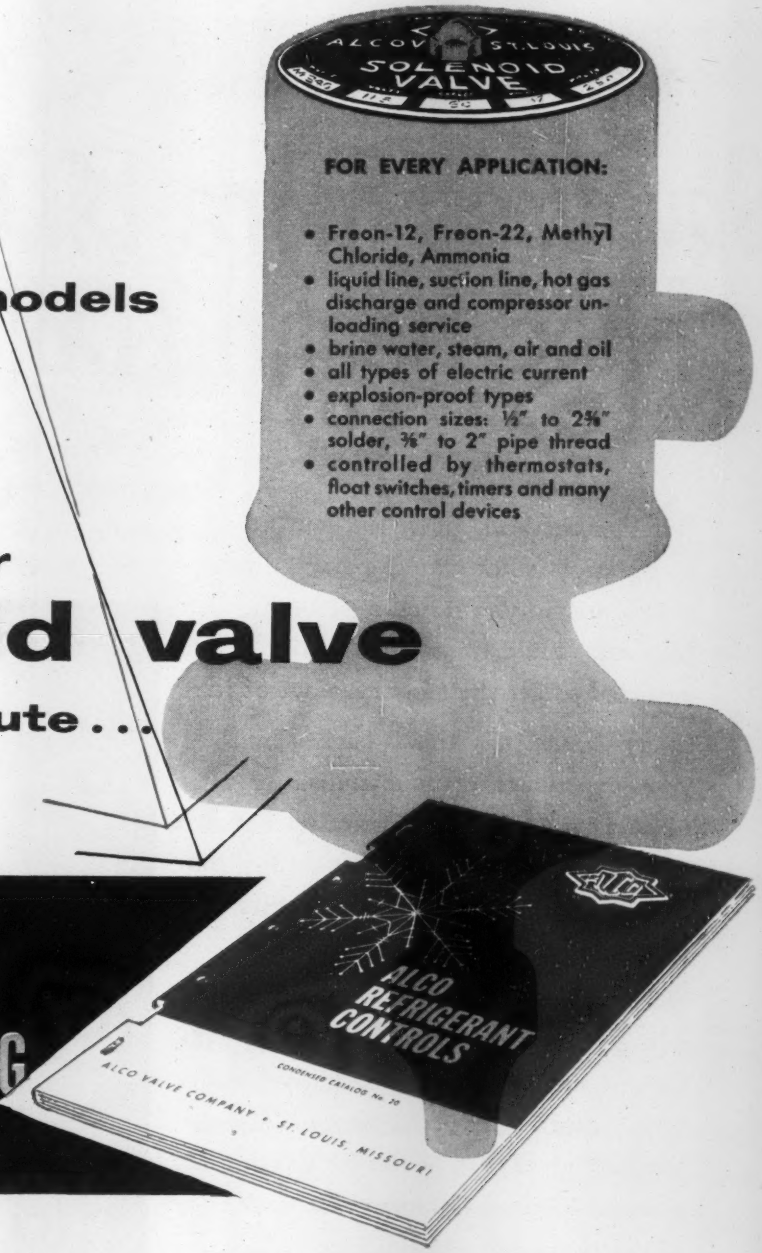
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...the complete line of solenoid valves at your fingertips. No lost time thumbing through other catalogs for any standard or special model!

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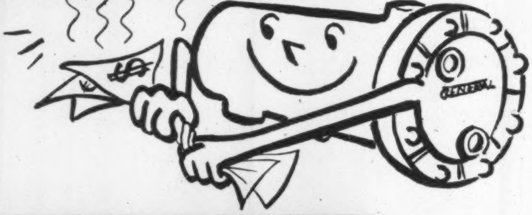
This specialized line

Squeezes more B.T.U.'s out of Fluid-heating Dollars



Whether the heat source for your next installation is hot water, exhaust steam, or live steam, you'll find a **GENERAL** Industrial Fluid Heater specifically designed to get the most heat out of it.

Every **GENERAL** heater is backed by 25 years experience in the manufacture of industrial fluid-heating equipment. It's the end-product of constant modification and improvement . . . "tops" for its particular application.

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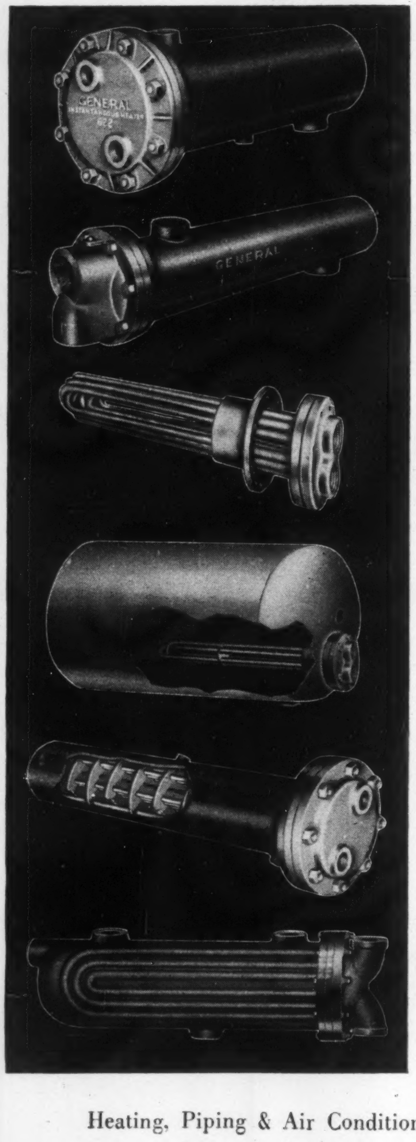
123 Georgia Ave., Providence 5, R. I.



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No tank required. 23 sizes; capacities to 300 g.p.m.; uses live or exhaust steam.

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74 sizes for economical heat transfer. Flow capacities up to 900 g.p.m.

TANK HEATING UNITS
20 sizes for all requirements.

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10 sizes; capacities to 315 gals.

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17 sizes; capacities to 375 g.p.h. at 2 lbs. pressure.

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15 sizes for use with large-size storage tanks.

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TANKLESS AND INDIRECT WATER HEATERS
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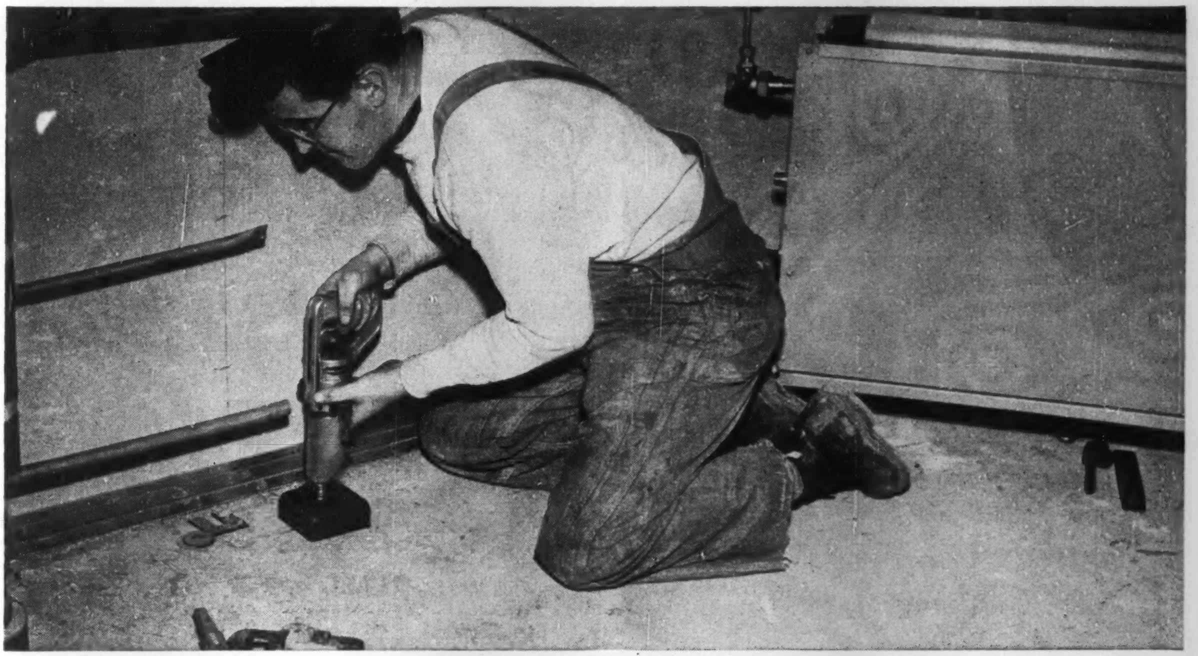

Cut fastening costs up to 80% on heating and air conditioning installations...with the

REMINGTON STUD DRIVER

"It saves us money on every fixture we install" —that's the kind of report we're getting every day on the Remington Stud Driver. Big savings just naturally result from the amazing speed of this powder-actuated tool. It sets as many as 5 studs a minute in steel or concrete!

You'll find real economy, too, in the fact that the Stud Driver is completely self-powered—no need for extra equipment, wires or cables. Compact and portable, the tool is designed in every way for easy handling. And since it weighs only 6 pounds, it's ideal for working overhead and in confined spaces.

What's your fastening job? Whether it's fastening pipe to walls and ceilings or anchoring fixtures to concrete floors, you'll save money with the Remington Stud Driver. For complete information on how to cut *your* fastening costs, just send in the coupon below.

QUESTIONS YOU ARE ASKING

QUESTION:

What are the studs made of?

ANSWER:

Genuine Remington studs are made of a selected molybdenum-bearing alloy steel, heat-treated for required hardness and ductility properties. All are plated for protection against corrosion.

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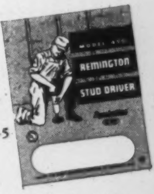

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Remington Arms Company, Inc.
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CERTIFIED RATINGS
Certified ratings are the result of tests made by the Manufacturer in accordance with the Standard Test Code for Centrifugal, Axial, and Propeller Fans; adopted jointly by the National Association of Fan Manufacturers and the American Society of Heating and Ventilating Engineers.
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- **QUIET OPERATING**
- **CERTIFIED RATINGS**

ALADDIN Series 94 Fans are available in 22 sizes of both backwardly inclined and forwardly curved types. Both types have been designed for the lowest rotational speeds consistent with high efficiency over the widest possible range of operating conditions.

Each fan is ruggedly built...fully equal to the job for which it is designed, and is backed by twenty-five years of know-how in manufacturing all types of air handling equipment.

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ALADDIN HEATING CORPORATION
1111 WEST AVENUE 137 • SAN LEANDRO, CALIF.
REPRESENTATIVES IN ALL PRINCIPAL CITIES IN THE WEST

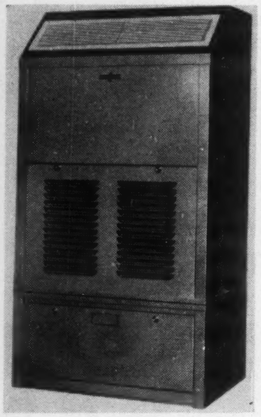
EQUIPMENT DEVELOPMENTS

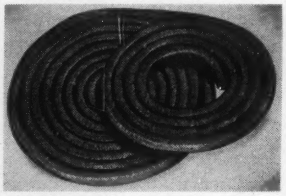
Continued from page 234

Solvent Resistant Packing

Two new mechanical rod packings using a new lubricant and impregnation process for handling non-water soluble solvents . . . . "Style No. 181" has a square braided rayon base and is recommended by the manufacturer for pumps, valves and fittings, handling such chemicals at temperatures up to 200 F. For temperatures over 200 F, "Style No. 1024," which has a high grade braid over braid white asbestos base, is recommended.

Manufacturer—Flexrock Co., Packing Div., 3603-K-Filbert St., Philadelphia 1.





Above: Packing

Left: Conditioner with grille

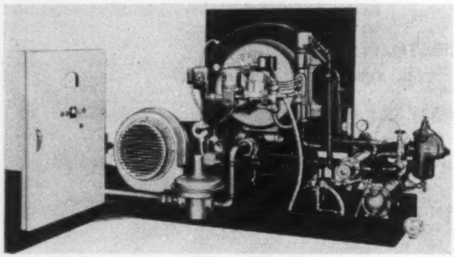
Filter Grille for Air Conditioner

"Weatherwise" CU air conditioning unit now is being produced with a new type of filter grille . . . . Made of heavy gage sheet metal, the grille has two rows of inverted louvers which direct the air upward through the filter screen. The manufacturer claims that the improved design protects the filter and gives longer life and greater efficiency. The 5 ton conditioner is a self contained unit designed for commercial use. It features a hermetically sealed compressor with "Freon," a capillary system and complete thermostatic control.

Manufacturer—Barkow Mfg. Co., 2230 S. 43rd St., Milwaukee 15, Wis.

Gas, Oil and Combination Burners

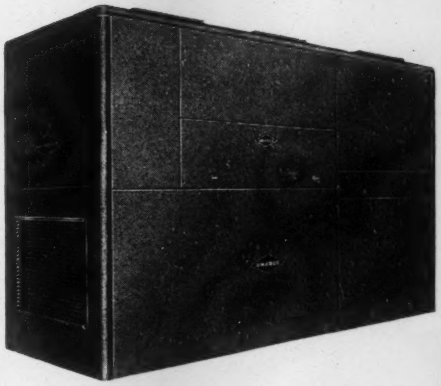
New series of packaged gas burners, oil burners and combination gas-oil burners for commercial-industrial heating and power applications . . . . Seven stock sizes are included in the line. Gas burners range from 3,750,000 to 24,000,000 Btu input; oil burners, from 25 to 145 gph. Each unit is equipped with an enclosed electrical



UNARCO year 'round weather conditioning*

SELF-CONTAINED HIGHBOY AIR CONDITIONER
2, 3, 5, 7½, 10, 15 TON CAPACITY

Compact, year 'round air conditioner provides quiet, efficient, economical performance . . . cools, heats, humidifies, dehumidifies, and circulates air . . . thermostatically controlled. Perfect for small stores, shops, offices, and all types of commercial applications.



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A complete air conditioning unit for heating, cooling, and ventilating . . . thermostatically controlled . . equipped with an evaporative condenser assuring minimum operating cost. Requires only three connections on the job site . . electric, water, and duct work. Sizes range from 3 to 50 H.P.

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332 SOUTH MICHIGAN BLVD. • CHICAGO 4 • WEBSTER 9-5444

For Easiest Pipe Cutting
... it's a heavy-duty
RIDGID

6 sizes:
⅛" to 6"—
4-wheel cutters
to 4"

RIDGID
No 2 HEAVY DUTY ⅛ TO 2
Every RIDGID Pipe Cutter TESTED for perfect tracking before shipment

You cut more pipe
with less work
with a RIDGID

Once you've put a RIDGID Cutter on a pipe and seen how easily and cleanly it rolls through the metal, you won't want any other kind. Smartly balanced for easy action. Tracks perfectly—and special malleable housing, guaranteed warp-proof, keeps it that way. High alloy thin-blade or heavy-duty cutter wheels, practically no burr. For fast cutting with least effort, ask your Supply House for a RIDGID.

THE RIDGE TOOL COMPANY • ELYRIA, OHIO, U.S.A.

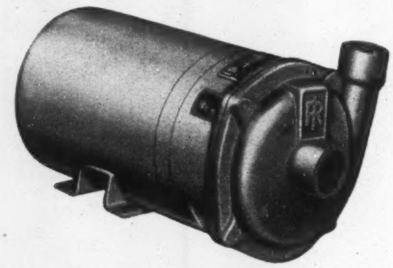
RIDGID
Work-Saver Pipe Tools

control panel and with a forced draft fan to deliver necessary air against a positive furnace pressure. Combination units and straight gas fired units include a low pressure ring-type gas burner, automatic gas controls, air volume control, and an electronic combustion control system. Oil burners of the rotary cup type are available for firing all grades of fuel oil.

Manufacturer—Petro, 3170 W. 106th St., Cleveland 11, Ohio.

Motor Pump Unit for Air Conditioning

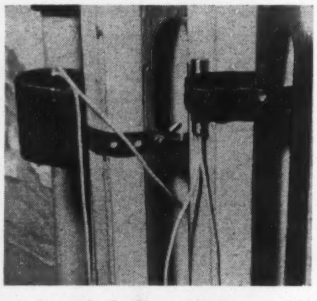
Air conditioning centrifugal pump known as the "¾ KRVSA Motorpump" . . . . It is a single stage, 3450 rpm unit with a keyed cap screw type impeller attachment for positive fastening. The smooth bronze, die cast, balanced impeller has a built in shaft sleeve to prevent motor shaft corrosion. Standard jet pump motors 1/3 through 1 hp are used and the pump is designed to deliver capacities to 48 gpm at heads to 100 ft. A mechanical seal consisting of a rotating ceramic face against a stationary face is said to prevent stuffing box drips and eliminate motor overloads.



Manufacturer—Ingersoll-Rand Co., 11 Broadway, New York 4.

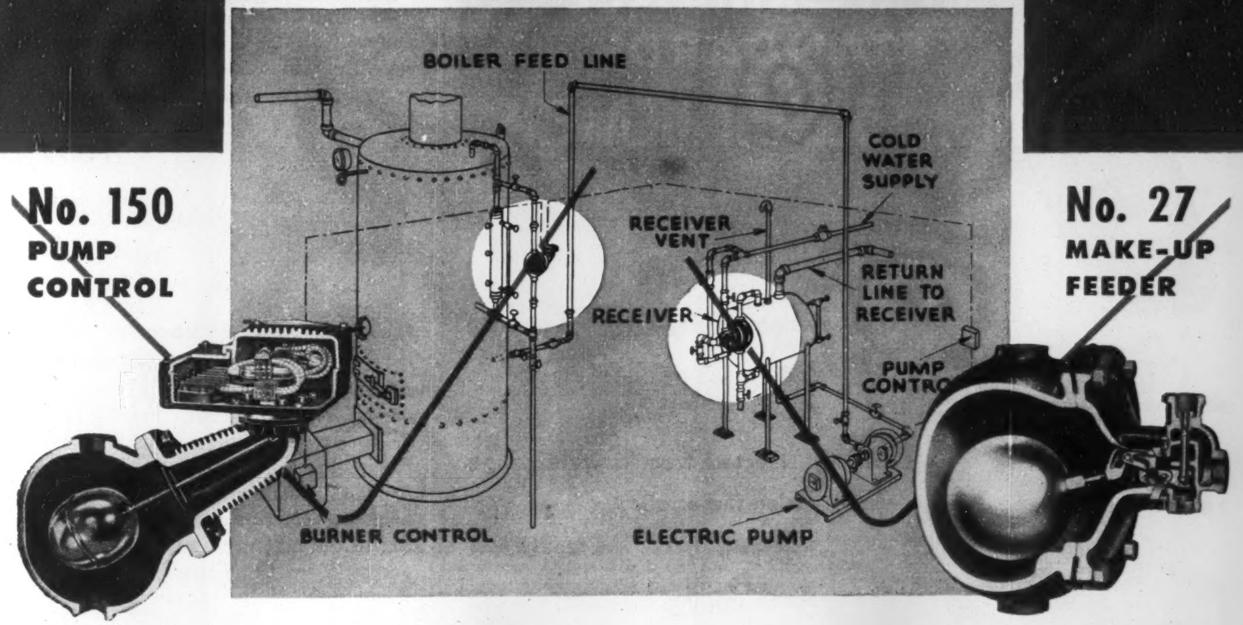
Radiator Temperature Unit

New system of measuring the temperature of electronically controlled heating regulator . . . . Known as the L-7016 "Steamstat," it consists of 12 resistance capsules which are mounted in a geometric pattern on the back of the radiator. Mounting straps and saddles are provided and each bulb includes a 30 in. length of conductor to permit proper installation of the elements at desired points on the radiator. The company states that the unit has no moving parts and requires no maintenance. All adjustments are made in the heat stabilizer panel to which it is connected.



Manufacturer—Minneapolis-Honeywell Regulator Co., 2641 4th Ave. S., Minneapolis 8, Minn.

Here's the GREAT COMBINATION for those Medium Pressure Boilers



Pump Control, Low-Water Fuel Cut-off and Low Water Alarm

The No. 150 has two mercury switches. One provides a circuit for starting and stopping feed pump; the other has circuits for low-water cut-off of the burner and for low-water alarm bell if desired. Underwriters' approved.

It is built throughout to stand up under pressure and temperature encountered in boilers of any type or size; maximum steam pressure, 150 lbs. It has no stuffing boxes to cause trouble. Packless construction is provided by extra-heavy monel sylphon bellows. Switch leads have heat-impervious, porcelain-bead insulation. Mechanism is sealed to guard against tampering. Thousands of installations attest the dependability of this control.

How to use them . . .

This is the team of thoroughbreds that takes all the worries and troubles out of water level and feed pump control for medium pressure boilers—boilers with steam pressures up to 150 psi.

The drawing above shows the simple hook-up. The No. 150 controls the boiler feed pump directly from the boiler water level. This holds the boiler water level within close limits that assures maximum steaming efficiency and fuel economy. Any deficiency in the returns is at once replaced by the No. 27 Make-up Water Feeder on the receiver.

An extra switch on the No. 150 provides circuits for cutting off burner and sounding low water alarm in the event of some emergency such as current interruption in the pump circuit or failure of make-up water supply.

Yes, this set-up gives you close control of the water level and maximum protection from low water. Ask for simple installation and wiring diagrams.

Float-operated make-up water feeder for receiving tanks

The No. 27 is used to supply make-up water to maintain the minimum water level required in condensate receiving tanks. Its large water feeding capacity makes it particularly effective in this service. Rugged, all bronze and stainless steel valve mechanism assures long life. The diagram shows how the No. 27 is installed with 1-inch equalizing pipe and ¾" water feed pipe. Every detail of the No. 27 speaks quality construction. It is for tank pressures up to 35 lbs. and water supply pressure up to 100 lbs. Other well-built McDonnell Make-up feeders are available to meet almost all installation conditions.

McDONNELL & MILLER, *Inc.*, 3500 N. Spaulding Ave., Chicago 18, Ill.

Doing One Thing Well

Your Jobber Stocks Them

McDONNELL *Boiler Water Level Controls*

take no less than these

TOP PERFORMANCE STANDARDS

for M&L FUEL OIL HEATERS

Expert design by experienced heating engineers

Carefully selected from a wide range of construction materials

Full protection against corrosion

M & L Guarantee against defects in workmanship and materials

You can be sure of all these if you specify a

M & L FUEL OIL HEATER

"U" TUBE 2 OR 6 PASS TYPE HEATER

There's a type for every fuel oil heating need—commercial or industrial.

They meet the standards of the Fuel Oil and Water Heater Manufacturing Association.

Send for our complete catalog including data on the new M & L Fuel Oil Guardian Heater (832-52-SA).*

*New York City Approval No.

TANK OUTLET OIL HEATER

Manning & Lewis Engineering Co.

M&L

2023

32 Ogden Street Newark 4, New Jersey

SALES REPRESENTATIVES IN PRINCIPAL CITIES

EQUIPMENT DEVELOPMENTS

Continued

Small Booster Pumps

Addition to the company's line of small booster pumps . . . . The No. 150 booster is a $1\frac{1}{2}$ in. circulating pump equipped with a $1\frac{1}{2}$ hp motor and is identical to the company's No. 125 booster in delivery capacity and dimensions, differing only in size of flanges. The small boosters are available in all bronze construction for pumping service water.

Manufacturer—Bell & Gossett Co., 8200 N. Austin Ave., Morton Grove, Ill.

Fungi Resistant Membrane

**"Richkraft 65" fungi resistant membrane for use in slab on ground construction . . . . The kraft liners are pretreated with a fungicide before being combined into the final product. Edgestring reinforcement helps prevent rips and tears. According to the manufacturer, it has been accepted by the FHA. Its tensile strength is 130 lb machine direction, 56 lb cross machine direction and 180 lb Mullen test. It is available in rolls 36 and 48 in. wide—432 sq ft; 60, 72, 84 and 96 in. wide—1000 sq ft each.

Manufacturer—The Richkraft Co., 510 N. Dearborn St., Chicago 10.

Bronze Electrode

"Bronzochrom" electrode "EutecTrode 1850," developed for high strength joining and for frictional and corrosion resistance on a variety of base metals . . . . The electrode produces copper base deposits alloyed with silicon, manganese and chromium, etc., to increase tensile strength and give additional resistance to wear and corrosion. According to the manufacturer, a special formulated flux coating with a controlled rate of disintegration restores to the deposit elements lost across the arc. The electrode is recommended by the firm for joining and overlaying steel, cast iron and copper alloys and for various combinations of ferrous and nonferrous metals.

Manufacturer—Eutectic Welding Alloys Corp., 40-40 172nd St., Flushing 58, N. Y.

FURNAS ELECTRIC

Magnetic Starters

Your most complete selection in the 1-50 hp range

NEW "IN-BETWEEN" SIZES SAVE ON COSTS AND UP TO 40% IN SPACE

Why Pay for Starter Capacity You Never Use? Now you can select the exact starter size matched to any application in the 1-50 hp range from the nine Furnas Electric sizes. Many in-between sizes can save you money and conserve space. Immediate delivery from stock.

Same Service, Less Money—Here's an example of how you can save: Suppose you want a starter for 10 hp service. It's no longer necessary to select a size 2 rated 25 hp. You save in cost and up to 40% in space by selecting a Furnas Electric type YE, the right starter for the job.

Important Features—1. Dual voltage coils matched to your motor. 2. Four-speed thermal overload protection. 3. Easy installation and wiring in shallow case. 4. Heavy contacts for long life.

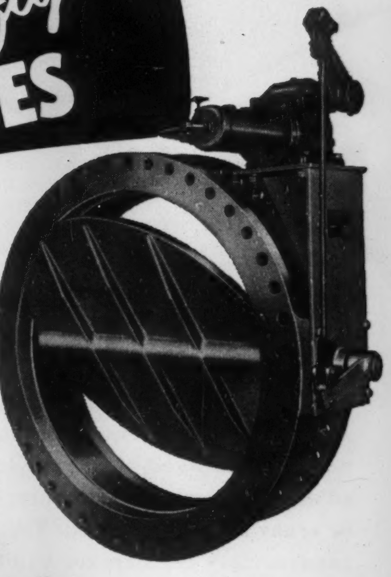
Complete Range of Other Products—Pressure switches for air and water applications. Drum controllers for reversing, multi-speed and reversing multi-speed service.

Write today for Bulletin No. 5402, giving the full story. Furnas Electric Company, 1041 McKee Street, Batavia, Illinois.

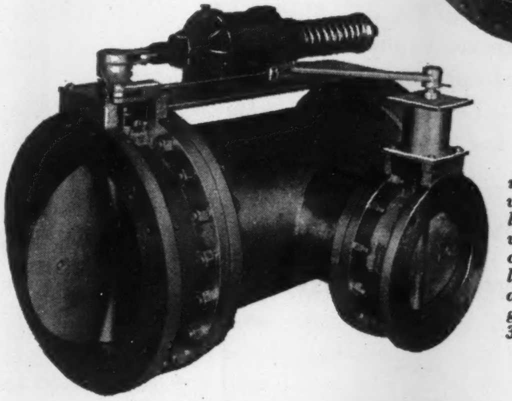
FURNAS
ELECTRIC
Batavia, Illinois

Get Positive Control and Safety

with W. S. ROCKWELL Butterfly VALVES



A 54" cast iron butterfly valve with stainless steel blade for low pressure air; equipped with crank type cylinder operator; installed in public utility plant.



Three-way valve made with 24" and 14" butterfly valves mounted on a "tee"; linked so as to close one valve when the other opens; operated by spring-loaded hydraulic cylinder; for air and exhaust gases to 60 p.s.i. and 350° F.

Rockwell Butterfly Valves are made of any required metal or rubber-lined for minimum pressure drop, uniform, quick control and positive shut-off—commercial, drip or air-tight. Sizes to 132"; pressures to 900 p.s.i.; temperatures to 2000° F., in standard and special types. Catalog on request.

ROCKWELL SINCE 1888 BUILT

W. S. ROCKWELL COMPANY

BUTTERFLY VALVES • SLIDE VALVES • AUTOMATIC VALVES

2544 ELIOT STREET • FAIRFIELD, CONN.

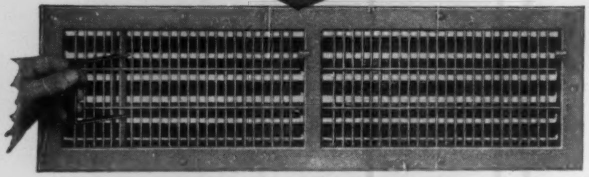
Sales Representatives in Principal Cities

INDEPENDENT

"Fabrikated"

REG. U. S. PAT. OFFICE

AIR CONDITIONING REGISTERS



No. 321-A HMV Tandem

Each front grille bar may be adjusted individually. As a result, the angles of deflection or combinations of grille bar adjustment are unlimited. These adjustments may be made when register is installed or at any later time desired. The valves in Independent HMV registers are readily set by a lever control located on the front to direct the air up or down, or the valves may be fully closed. Available in a number of small and large sizes.

Always Leading—
Always Progressing

MEMBER
NATIONAL WARM AIR HEATING
INDOOR COMFORT
AND AIR CONDITIONING ASSOCIATION

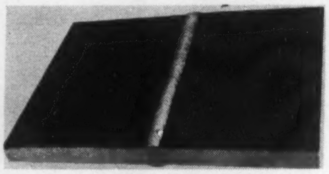
THE INDEPENDENT
REGISTER CO.
3747 E. 93rd STREET • CLEVELAND, OHIO

EQUIPMENT DEVELOPMENTS

Continued

Electrode with Powdered Metal Coating

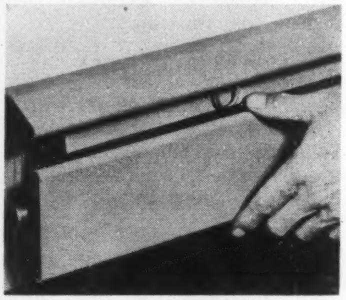
"Jetweld 2," second in the series of newly developed line of electrodes with powdered metal in their coatings . . . . It is designed for welding butt and deep groove joints. According to the company, some of the features include good x-ray qualities, easy slag removal, smooth appearance and low crack sensitivity. The additional source of metal is available to permit higher deposition rates at usable currents. The problems created by the excessive amount of heat in the arc are said to be eliminated because the excess heat is used to melt the metal in the coating. The electrode is available in 5/32, 3/16, 7/32 and 1/4 in. diameters.



Manufacturer—The Lincoln Electric Co., 22801 St. Clair Ave., Cleveland 17, Ohio.

Snap-On Baseboard Radiation Unit

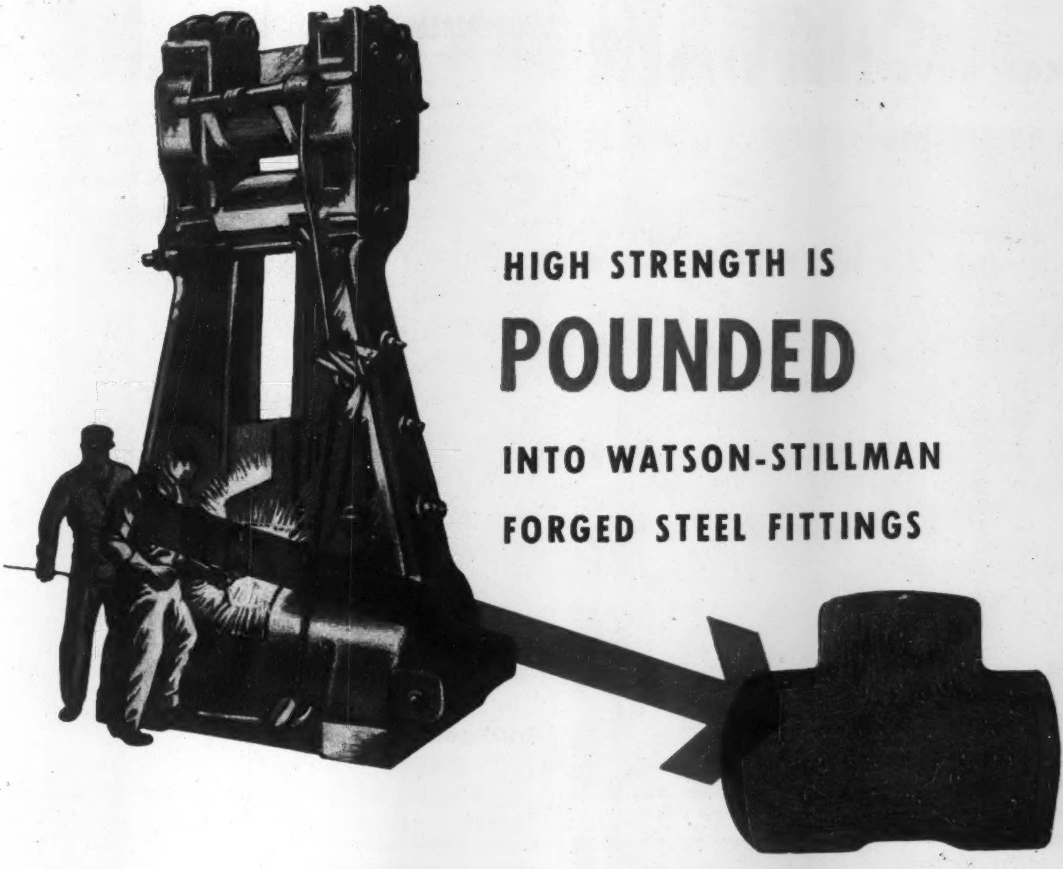
"Time Saver" baseboard radiation heating units have snap on feature for assembling the various parts . . . . The manufacturer states that the snap on feature eliminates screws, fasteners and results in providing greater heating efficiency because of the unobstructed opening at the bottom and top of the front panel. A one piece metal back rests on the floor and is nailed to wall studs. The bracket snaps in and a control damper snaps in under the cover. The heating element is then slipped on to the bracket. Finally, the metal front panel is snapped on to the bracket. Accessories such as the end caps, trim strips and joining strips are also snapped on.



Manufacturer—The Rittling Corp., The Rand Bldg., Buffalo 3, N. Y.

Automatic Glass Fiber Air Filter

"Roll-O-Matic" automatic self cleaning air filter using a glass fiber filtering medium to clean both outside and recirculated air . . . . The filter combines the characteristics of both the dry type and viscous impingement air filters. The media is a continuous length of fiber glass material supplied in rolls of approximately 70 linear ft. The material from the roll of clean medium, mounted at the top of the filter casing, is transported on a continuous



HIGH STRENGTH IS

POUNDED

INTO WATSON-STILLMAN FORGED STEEL FITTINGS

Forged-Fiber Grain Structure Gives Added Protection Against Piping Failures

Watson-Stillman fittings are drop-forged. Hot steel billets are hammered and pounded and squeezed in hardened dies to form the solid fittings. This operation produces a dense, tough-fiber structure with exceptionally high tensile and impact strength...higher than can be obtained by other processes. W-S Forged Steel Fittings offer maximum resistance to pressure, heat, corrosion, shock and vibration...give you strong, tough, trouble-free joints.

Watson-Stillman Fittings are designed for high strength, too...with extra heavy sections where you need them. And they're precision machined to insure perfect alignment and tight joints.

For safe, reliable service...for greater protection against costly shutdowns...install Watson-Stillman Forged Steel Fittings. Available in SCREW-END and SOCKET-WELDING types in carbon, stainless and alloy steels.

Sold Through Leading Distributors

WATSON-STILLMAN FITTINGS DIVISION

H. K. PORTER COMPANY, INC.

Roselle, New Jersey

You can have **DRY AIR**
with exact moisture control..

Assembling Electronic Parts

**FOR
YOUR COMFORT
FOR
YOUR PROCESS
FOR
TESTING MACHINES
OR MATERIALS AT
ANY TIME OF
THE YEAR**

Packaging Food Products

Drying Industrial Material

● This Niagara "Controlled Humidity" method gives you the **MOST EFFECTIVE** Air Conditioning because its cooling and heating functions are made completely separate from adding or taking away moisture. This assures you always a precise result. No moisture sensitive instruments are needed.

MOST FLEXIBLE. You can reach and hold any condition in response to instrument settings, or vary it as you wish.

EASIEST TO TAKE CARE OF. The machine is accessible, the control circuits are simple and easy to operate, and there are no solids, salts or solutions to be handled.

MOST COMPACT. It does a very large amount of work in a small space.

INEXPENSIVE TO OPERATE. At normal atmospheric temperatures (unlike systems that use refrigeration to dehumidify) it needs no summer re-heat.

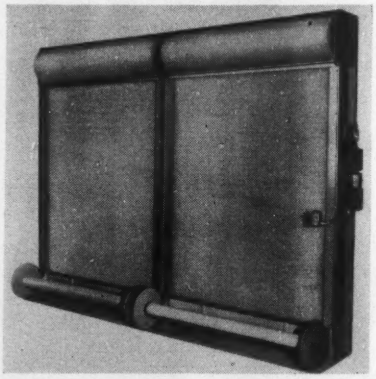
Write for Bulletins 112 and 122

NIAGARA BLOWER COMPANY

Dept. HP, 405 Lexington Ave. New York 17, N. Y.

Niagara District Engineers in Principal Cities of U. S. and Canada

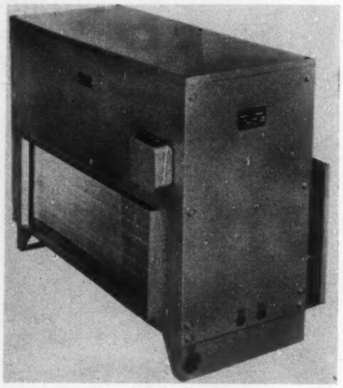
screen that rotates over top and bottom sprockets, down the face of the filter and is rerolled at the bottom after collecting its dust load. A pressure switch sensitive to the resistance differential across the filter curtain actuates a drive motor that rotates the screen and feeds a certain amount of clean medium into the filter curtain when the resistance reaches a predetermined point.



Manufacturer—American Air Filter Co., Inc., 373 Central Ave., Louisville 8, Ky.

Packaged Air Conditioner

"Cool-Pack" packaged air conditioner . . . . The unit delivers three to four tons of cooling capacity with a 1½ hp compressor, the manufacturer states. A combination water coil and "Freon" coil is designed to use water up to 70 F. An auxiliary booster blower is available. With the addition of the blower attachment the air conditioner may be used for commercial applications. Working on a single phase current, the compressor is said to eliminate power and wiring problems.

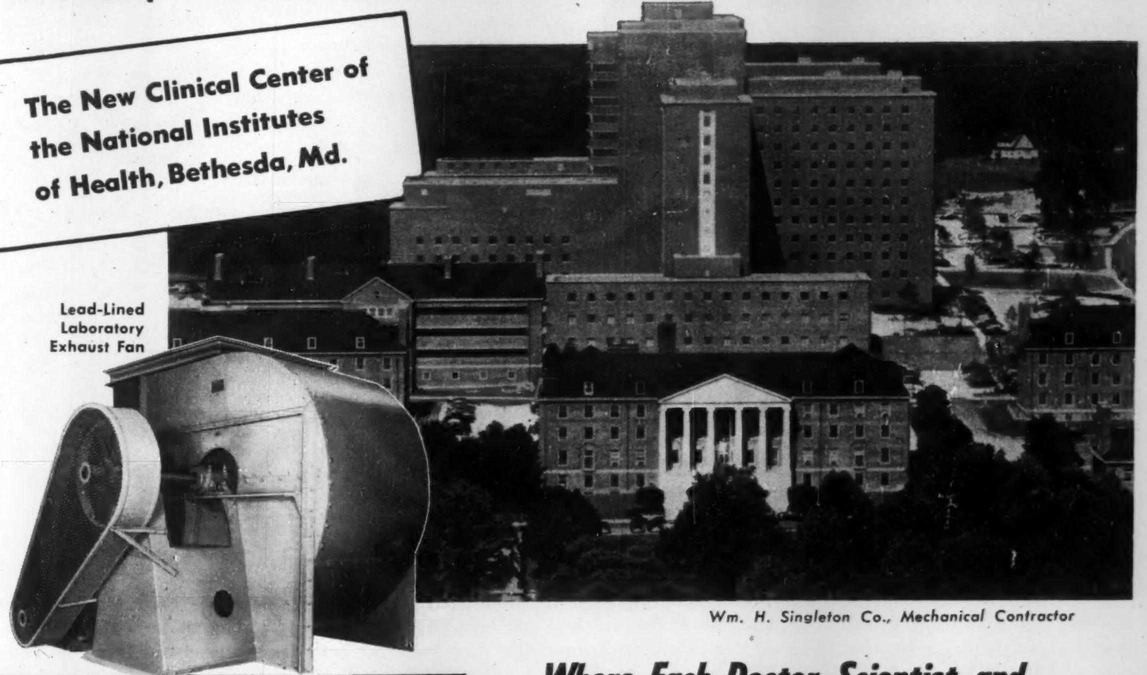


Manufacturer—Hastings Air Control, Inc., 3215 Leavenworth St., Omaha 5, Neb.

Solenoid Direct Lift Valve

Stainless steel solenoid direct lift valve, corrosion resistant, in ⅛ in. and ¼ in. pipe sizes . . . . Pressures are 5000 psi to 150 F maximum, 2500 psi to 400 F maximum. Orifice sizes range from 1/16 in. to 3/16 in. diameter depending on pressure requirements and coil used. Paper wound or glass impregnated coils are used depending on the temperature range. For use on tempera-

HIGH, WIDE and HANDSOME...

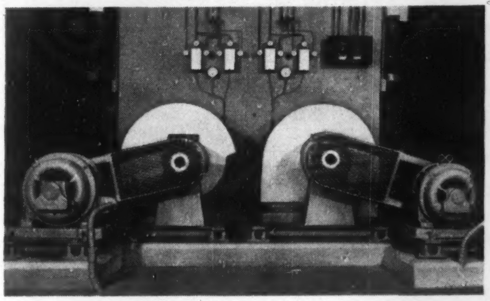


The New Clinical Center of the National Institutes of Health, Bethesda, Md.

Lead-Lined Laboratory Exhaust Fan

Wm. H. Singleton Co., Mechanical Contractor

The Complete Air Conditioning System Serves Spacious Sunrooms On Each Floor.



High Pressure Supply Fans.

Where Each Doctor, Scientist, and Patient is SPECIALLY SELECTED

AIR-HANDLING EQUIPMENT by Bayley

Representing an investment of approximately 64 millions of dollars, no expense has been spared to provide the very finest in construction, facilities, and equipment in the new Clinical Center of the U.S. Health Service at Bethesda, Md. Admission is restricted to patients selected for experimental treatment in research for certain diseases.

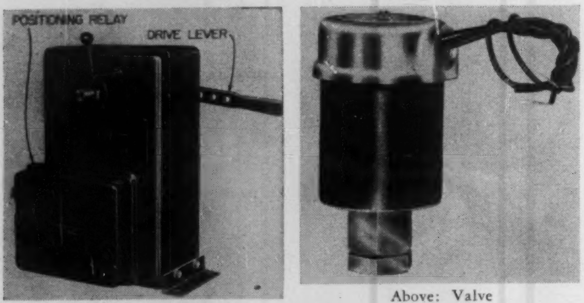
We take exceptional pride in having been chosen to furnish the specially designed Fan equipment for the extensive and intricate air handling system serving this great health establishment.

Bayley BLOWER COMPANY
Engineered Air-Handling Equipment
6600 W. BURNHAM STREET • MILWAUKEE 14, WISCONSIN

EQUIPMENT DEVELOPMENTS *Continued*

tures in excess of 180 F, glass wound, silicone impregnated coils are recommended by the manufacturer. Coils used on normal pressure ranges are single wound; for higher pressures, double wound coils with a primary winding for initial pull-off and a normal winding for holding the armature in the coil field during operation are used.

Manufacturer—Atkomatic Valve Co., Dept. B 108, 545 Abbott St., Indianapolis, Ind.



Above: Valve
Left: Regulator

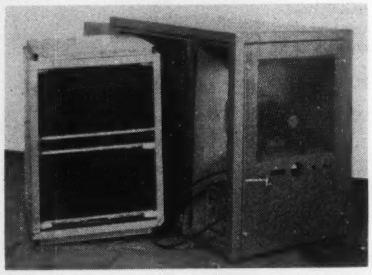
Flow Regulator

Pneumatically operated control drive for gas and liquid flow regulation . . . . A pneumatic signal actuates a positioning relay which in turn positions a piston operated drive lever arm. Three different characteristic cams are supplied and may be shaped if necessary. The manufacturer states that the drive may be installed in any position on a column, pipe or flat surface. Time required for full travel is adjustable. The drive has a 4 in. piston stroke at a torque of 75 ft-lb. It operates in standard SAMA signal ranges 3-15 and 3-27 psi. Standard connecting linkage is available from stock.

Manufacturer—Bailey Meter Co., 1050 Ivanhoe Rd., Cleveland 10, Ohio.

Electrostatic Dust Collector

**"Sterilshield Space Cleaner" for use in locations where it is desired to lower the dust, smoke, pollen or bacteria content of the air . . . . The unit uses a 1000 cfm capacity electrostatic air cleaner. It is mounted on casters for portability. The manufacturer states that the dust collector cell can be removed from its compartment and cleaned by means of running water.



Manufacturer—The Baker Co., Maplewood, Maine.

Phoenixspun FABRICATING...

Solves Production-Forming Problems Like This—

SPINNING "jumbo" sized forms like this inlet bell for a large ventilating blower is no problem the PHOENIXSPUN way! — A rolled and welded sheet of 14-gauge steel becomes an inlet bell 24" deep and 72" in diameter, under the skilled hands of master craftsmen. Large or small, your special forming needs can be served as readily.

METAL SPINNING

WELDING
(Inert Gas, Arc, Oxy-Acetylene)

DEEP DRAWING
(To 350 Tons)

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WRITE for Illustrated Bulletins, or send prints and specifications for prompt quotations.

Metal Spinning Div., **PHOENIX PRODUCTS CO.**

4707 N. 27TH STREET • MILWAUKEE 16, WISCONSIN

"Let's talk one-piece construction!"

"We're at the crossroads, Bob. We've got to have more heat exchange capacity, yet we can't afford new equipment. What can we do?"

"Well, you've pretty much answered that question yourself. You said you were at the crossroads—I use that expression to describe the point where using Wolverine Trufin* is more economical than prime surface tube. In other words, Mr. Jones, you should retube with Trufin—the integral finned tube."

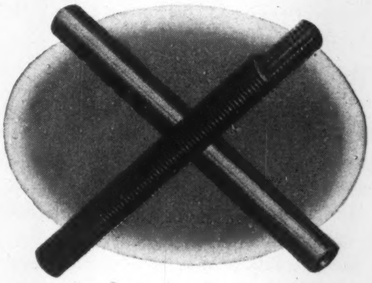
"What exactly do you mean—integral?"

"Well, let's talk one-piece construction. You see, fins are extruded right from the tube wall. Because the tube is finned, you get more heat transfer surface in a smaller area. And, because the fins are an integral part of the tube, you get more heat transfer. In short: vibration, temperature shock, pressures can't jar the fins loose. Your problem isn't any different than the one we had a month or so ago. This company had a small stand-by condenser—they also needed to boost their total condensing capacity. So, they retubed the small unit with Trufin and hooked it up in parallel with their larger prime surface unit. Well, production of the smaller Trufin unit equalled that of the larger prime surface installation. As a result, they eliminated the need for an entire new condenser!"

"Boy! If we can only do that, too!"

"You can! I'll outline the idea in a letter to you this afternoon. I can prove that you will save in the long run."

WHEN IT'S TIME TO RETUBE: be sure to consider Trufin. *It pays!* It's available in copper, copper-base alloys, aluminum, bi-metal, electric-welded steel and other metals. And write for a copy of Wolverine's Trufin Data Sheet. You'll find all the information you'll need. WOLVERINE TUBE DIVISION of Calumet & Hecla, Inc., 1461 Central Avenue, Detroit 9, Michigan.



Wolverine Trufin and the Wolverine Spun End Process available in Canada through the Unifin Tube Co., London, Ontario

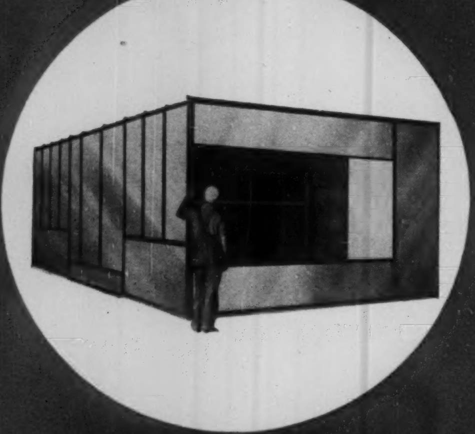
*REG. U. S. PAT. OFF.

EST. 1916

WOLVERINE TUBE DIVISION
OF CALUMET & HECLA, INC
Manufacturers of Quality-Controlled Tubing

PLANTS IN DETROIT, MICHIGAN, AND DECATUR, ALABAMA • SALES OFFICES IN PRINCIPAL CITIES

EXPORT DEPARTMENT 13 EAST 40TH STREET NEW YORK 16, NEW YORK.



ALWAYS ORDER

A&R ARTICULATED AIR CONDITIONING UNITS

FOR

LOWEST ERECTION COST
CLEAN WORKSITE
COORDINATED DESIGN
PANEL CONSTRUCTION
FACTORY INSULATION
FACTORY WEATHERPROOFING

CONSULT NEAREST FACTORY REPRESENTATIVE OR

AIR & REFRIGERATION CORPORATION

439 MADISON AVE. NEW YORK 22, N.Y.
271 MILTON AVE., S.E. ATLANTA, GA.

EQUIPMENT DEVELOPMENTS

Continued

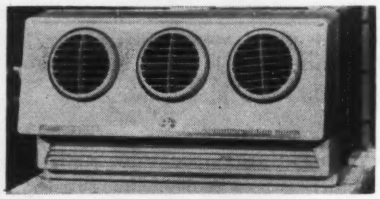
Hook-on Volt-Ammeter

Hook-on volt-ammeter with automatic scale changing . . . . Designated the "AK-5," the pocket-size unit is designed to measure current and voltage quickly. It has a current range of 5, 20, 80 and 350 amperes. The instrument also is designed to measure a-c voltage in three ranges — 150, 300, 750 — without auxiliary equipment. The company states that the volt-ammeter will clamp around any conductor up to 2 in. in diameter. Its contoured trigger closes and opens the hook-on assembly, which is covered with insulation to help safeguard against grounding or short circuiting. The desired range and scale is obtained by turning the unit's switch knob. Current scales are marked in black; voltage scales in red.

Manufacturer—General Electric Co., 1 River Rd., Schenectady 5, N. Y.

Window Air Conditioner

"150 WAC," a 1½ hp self contained "Vornado" window unit designed to cool an area up to 1000 sq ft . . . . Air is directed into the room at 1400 fpm through three air circulators. A pushbutton control system regulates cooling, ventilating, recirculation, exhausting or dehumidification. Exhaust and damper doors are controlled by electric solenoids. According to the company, the unit is capable of removing up to 13½ gal of water from the air in a 24 hr period. All air passing through the unit is filtered.



Manufacturer—The O. A. Sutton Corp., 1812 W. Second St., Wichita 2, Kan.

Power Roof Ventilator

"Ejectair" power roof ventilator, centrifugal backwardly curved blower type . . . . The manufacturer states that the blower wheel cannot be overloaded regardless of length or curves in the duct or variation in design. It is belt driven to provide flexibility. The ventilator is mounted on a built up curb on the roof. Special features include low profile with streamlined design and a corrosion resistant housing. The motor and fan bearings are grease packed ball bearings and are out of the air

These attractive Allen-Bradley Solenoid Starters add to the neat and business-like appearance of this machine.

DEEPFREEZE'S

Sub-Zero Machine

equipped with

ALLEN-BRADLEY TROUBLE FREE MOTOR CONTROLS

A-B

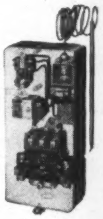
Quality

A-B Bulletin 709 Solenoid Starter

Size 1 Starter with cover removed. See how simple it is! The white interiors of Allen-Bradley enclosed apparatus make installation easy in dark places.

A-B Special Air-conditioning Control Unit

Consists of Bulletin 709 Solenoid Starter, Bulletin 836 high pressure cutout, Bulletin 837 thermostat with adjustable knob, and Bulletin 600 manual switch, for fan operation.



Why are Allen-Bradley starters so popular for refrigeration and air-conditioning service? . . . because experience has proven them to be trouble free. Only ONE moving part. No pivots, pins, or bearings to corrode or stick . . . no jumpers to break. You install them . . . and forget them!

No contact maintenance . . . Allen-Bradley silver alloy contacts never need cleaning, filing, or dressing. They are always in perfect operating condition.

Dependable overload relays . . . Allen-Bradley "solder pot" relays are accurate and always dependable . . . even after long service.

The Allen-Bradley trademark stands for "Quality" in electric motor control.

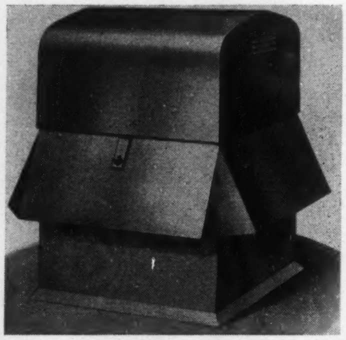
Allen-Bradley Co., 1335 S. First St., Milwaukee 4, Wis.

ALLEN-BRADLEY SOLENOID MOTOR CONTROLS

New
TOLEDO
PIPE CUTTER
for Cleaner Smoother Cut-offs!
TOLEDO
1/8-2
Heavy Duty
Wheel and Roller
RELY ON THE LEADER!
TOLEDO PIPE TOOLS...
POWER PIPE MACHINES . . . POWER DRIVES

★ Positive clean-cutting action.
★ Hooks on pipe easily . . . tracks perfectly . . . sturdy malleable frame formed to fit the hand and guaranteed warp-proof.
★ High alloy steel cutter wheels leave practically no burr.
★ Rollers in hook provide a square base when starting tool on pipe. Cuts 1/8" to 2" pipe . . . with speed and ease! Order through your supply house. Write for new catalog. The Toledo Pipe Threading Machine Co., Toledo, Ohio. New York Office: 165 Broadway, Room 1310.

stream. A manually operated safety cutoff switch is provided.

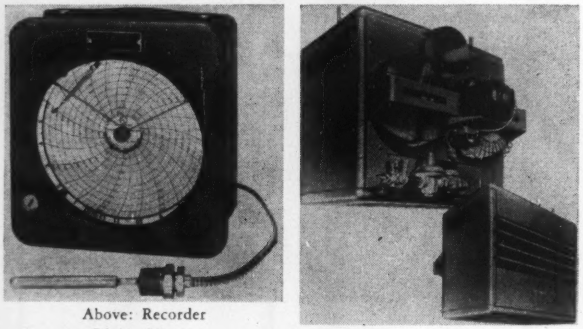


Manufacturer—Hayes Furnace Mfg. & Supply Co., 2929 S. Fairfax Ave., Los Angeles 16.

Twin Fan Gas Unit Heater

A 250,000 Btu twin fan model added to company's line of gas fired unit heaters . . . . The two fans, operating from a single heavy duty 1/4 hp motor, are designed to move 3200 cfm with an air throw of 83 ft. The manufacturer states that the smaller fans provide effective air distribution at low noise level. Burner arrangement is from back to front and the access panel to pilot and burners is across the back.

Manufacturer—Reznor Mfg. Co. Mercer 8, Pa.



Above: Recorder
Right: Heater

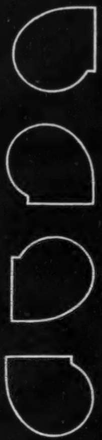
Temperature Recorder

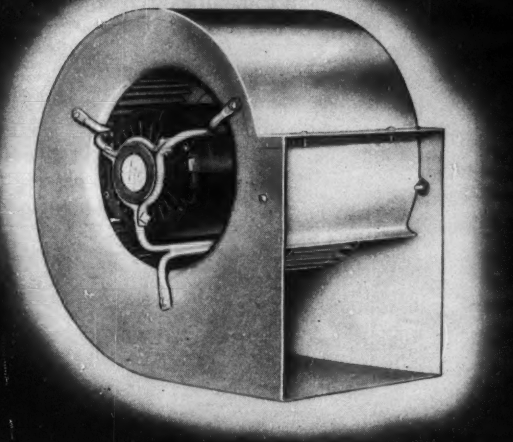
"Model 1000," new temperature recorder added to line of industrial thermometers . . . . It is available with 24-hr or 7-day electric or mechanical chart drive. Standard charts have ranges between −40 F and +500 F. Wall and portable models are available.

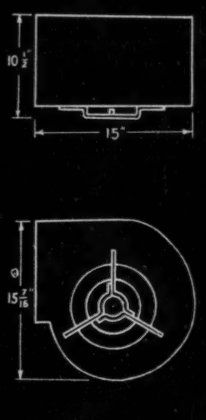
Manufacturer—The Electric Auto-Lite Co., Instrument and Gauge Div., Toledo 1, Ohio.

Refrigeration Service Hoses

**Two new refrigeration service hoses designed for low diffusion of refrigerants . . . . According to the manufacturer, the hose features freedom from contamination of the refrigeration system, resistance to oil and serviceability over a temperature range of −40 F +250 F. Style "3541" is designed for use with "Freon 12." Style "3452" is for use with "Freon 22." Both styles are the newest *Brundage* development . . .







INSTALLS IN ANY POSITION

***ONLY 10-1/2" x 15" x 15-7/16"
YET IT DELIVERS 1150 CFM AT .30 STATIC**

**Direct Drive Units in higher and lower capacities also available . . . information upon request.*

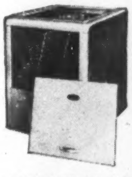
THE *NEW* BRUNDAGE 9" DIRECT DRIVE BLOWER

Here is one case where the biggest value comes in the smallest possible package. This new 9" Brundage Blower combines extremely high air handling capacity with a compactness and flexibility to make every cubic inch of equipment work to its fullest.

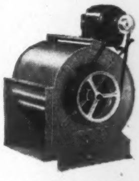
The internally mounted motor not only insures space economy and, by eliminating all belts and pulleys, it cuts the cost, ends a major maintenance problem . . . a design simplification that pays dividends in many, many years of superior service. To give you complete freedom of design, the 9" Brundage Blower may be furnished with mounting legs which allow you to place the unit in any convenient position . . . with full assurance of peak operating efficiency.

Test a Brundage 9" Blower in your own engineering department. Learn how Brundage design, construction and performance can add a new measure of quality to your products. We will be happy to provide everything you need to make a careful evaluation.

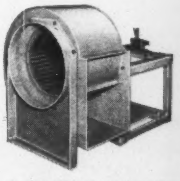
Ask about the Brundage production program. It is planned to simplify your inventory problems and free capital which might be tied up in blower stocks.



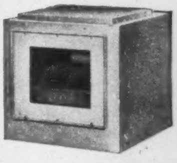
BLOWER-FILTER UNITS



BELT DRIVE BLOWERS



BLOWER EXHAUSTERS



SPECIAL BLOWER CABINET ASSEMBLIES

MEMBER
INDOOR COMFORT

"INTEGRITY IS OUR TRADITION"

Brundage
COMPANY

PRODUCTS OF CHARACTER

503 NORTH PARK STREET
KALAMAZOO, MICHIGAN

We would like to have further data on:
Direct Drive Blowers ( )
Belt Drive Blowers ( )
NAME..........
TITLE..........
COMPANY..........
ADDRESS..........
CITY.......... **STATE**..........

INSTALL ANY COMBINATION!

ADD SUMMER COOLING
TO THE NORMAN
DUCT FURNACE IN

One Prize Package

Norman winter-summer air-conditioner

. . . COMBINING a horizontal gas-fired furnace with independent cooling in ONE completely engineered package.

★ **Start with the Norman Duct Furnace,** if you like! A heating unit so flexible, it can be installed in the ducts of warm air and air conditioning systems for residential, commercial and industrial heating.

You'll find the Norman Duct Furnace adaptable to existing ductwork for use with the air handling unit of adequate summer air conditioning systems.

★★ **Get set for summer cooling!** Install the Norman Duct Furnace with its own damper compartment and blower now! Makes a complete gas-fired forced air heating system . . . ready for future summer cooling with most any refrigeration unit provided that ductwork is adequate for air conditioning.

★★★ **Year 'round "Hidden Comfort" in ONE package:** Norman Duct Furnace combined with cooling unit and blower makes complete year 'round air conditioning. The entire unit is so compact that it can easily and economically be installed in the attic or crawl space of to-day's modern homes.

Manufacturers of a Complete Line of Gas Heating and Air Conditioning Equipment

Norman® products company

1150 Chesapeake Ave., Columbus 12, Ohio

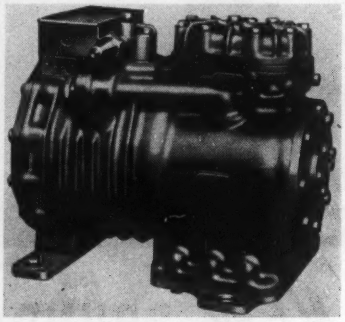
SEND for illustrated literature, complete with dimensions and specifications for your files

manufactured in sizes from 3/8 to 1 1/4 in. ID. Hoses can be either textile or wire reinforced.

Manufacturer—Electric Hose & Rubber Co., Wilmington, Del.

Motor Compressors

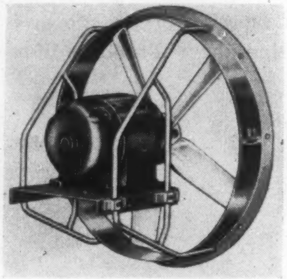
Several sizes of "Copelametic" motor compressors are now being offered with suction cooling . . . . In these models, ranging up through 3 hp, the gas cools the motor by passing through a chamber around it. The "Freon" does not come in contact with the oil. Through this design, it is said the motors will not require cooling by water or air. According to the manufacturer, there are no belts or seals and no manual lubrication is needed.



Manufacturer—Copeland Refrigeration Corp., Sidney, Ohio.

Direct Drive Fan

Heavy duty direct driven fan for industrial applications where a large volume of air is required under static pressure . . . . The ring mounted units are available in diameter sizes from 12 in., delivering 980 cfm of air, to 48 in. diameters delivering 32,400 cfm. Totally enclosed motors are furnished with the fans.

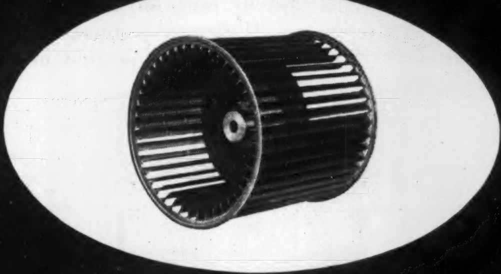


Manufacturer— M & E Mfg. Co., 2571 Winthrop Ave., Indianapolis 5, Ind.

Fin Design for Heat Transfer Surface

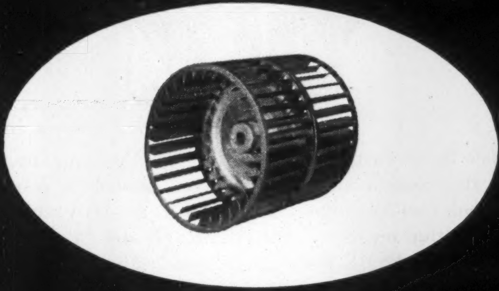
New "Delta-Flo" fin design to improve the efficiency of extended heat transfer surface. . . . The fins have a delta-shaped ridge formed near the leading edge of the fin surface and in front of each row of tubes in multi-row coils. This triangular ridge is designed to increase air turbulence over the entire fin surface. The manufacturer states that the design also in-

LAU Specialized Blower Wheels



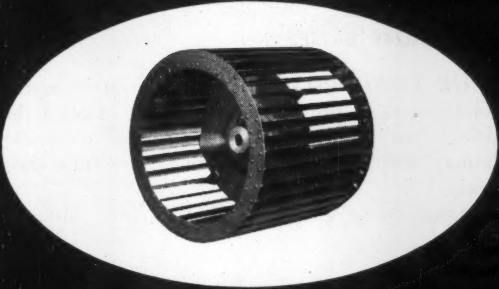
in a tremendous range of sizes . . . for every need!

You'll find LAU your BEST source of Blower Wheels of every size and type . . . because LAU is specialized for production tooling of highest quality at low cost.



Single Inlet . . . End Suspended . . . Center Suspended . . . Double Inlet . . . forward curve centrifical Blower Wheels with baked aluminum enamel finish. Can also be supplied with Hot-Dip Galvanize or Ruspruf special finishes.

Many sizes available with Power Lock Hubs.



SIZES:

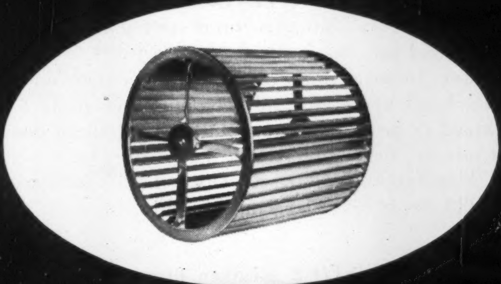
1 3/4″ to 30″ width
4 1/4″ to 30″ diameter

BORES:

0 1/4″ to 3 1/2″

CAPACITY RANGE

50 to 22,000 cfm
0″ to 2″ static pressure



Write today for catalog pages 707

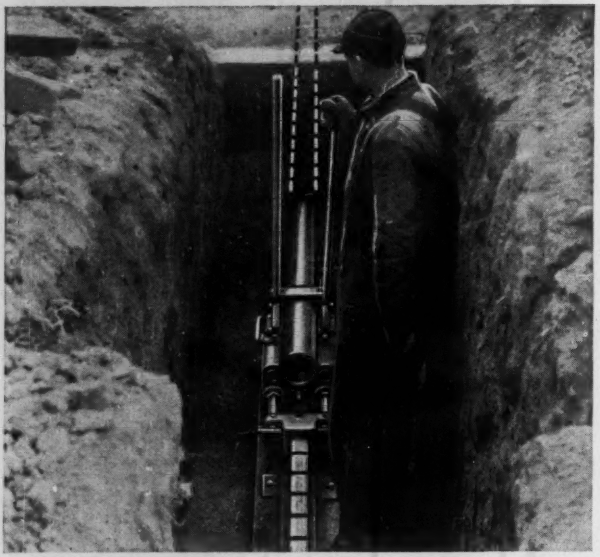
THE LAU BLOWER COMPANY • Dayton 7, Ohio

LAU World's Largest Manufacturers of Air Conditioning Blowers

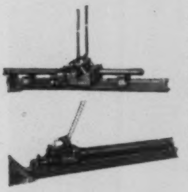
SAVE HOURS, CUT COSTS

ON YOUR PIPING JOBS WITH

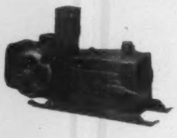
GREENLEE PIPE PUSHER



Here's the quick, simple way to install underground pipe. With a GREENLEE Hydraulic Pipe Pusher *one man* pushes pipe *under* streets, walks, tracks, lawns, floors and other obstacles. Cuts job time to a fraction . . . no costly tearing up of paving . . . eliminates extensive ditching, as just a short trench accommodates the Pusher. No tedious tunneling, back-filling, tamping or re-paving. Greatly reduce job time, reduce costs with the GREENLEE which often pays for itself on the first few jobs. Compact, portable, powerful. Get facts today.



Two sizes to fit the exact needs of yours jobs: No. 790, at left, for ¾ to 4-inch pipe. 6,500 to 40,000 lbs. pushing power. No. 795, lower left, for pipe larger than 4-inch, concrete sewer pipe, large drainage ducts. 25,000 to 150,000 lbs. pushing power. Power pump at right for extra ease and speed of operation.



TOOLS FOR CRAFTSMEN

GREENLEE

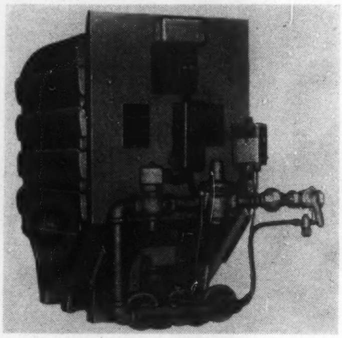
Greenlee timesaving tools for plumbing and heating work . . . Hydraulic Pipe Benders • Tubing Benders • Hydraulic Pipe Pushers • Pipe Bits • Auger Bits • Spiral Screwdrivers • Chisels and Many More. Write for details. Greenlee Tool Co., 2345 Twelfth Street, Rockford, Illinois.

creases fin strength and helps protect the coil from damage caused by rough handling. The fins are mechanically bonded to coil tubes in a solderless joint that is claimed to be as strong as the metal itself and to provide maximum heat transfer efficiency.

Manufacturer—The Trane Co., La Crosse, Wis.

Gas Fired Hot Water Boilers

**Line of gas fired cast iron hot water boilers covering a capacity range of 45,000 Btu input to 450,000 Btu input . . . . Horizontal sections with "zig-zag" circuit are designed to permit the absorption of more heat per lb of cast iron. According to the company, the low water content of the boiler gives quick heat response and good fuel economy. All boilers are AGA approved for operation on manufactured, natural and LP gas and carry a 100 lb ASME working pressure rating.



Manufacturer—Hydrotherm, Inc., Northvale, N. J.

EQUIPMENT BRIEFS . . .

AIR CONDITIONER TIMER to start and stop air conditioners at pre-set times. . . . Called the "1919-GSK," "on" and "off" trippers are set on a 24 hr dial. It may also be set for operation on certain days of the week.

Manufacturer—Tork Clock Co., Inc., Mount Vernon, N. Y.

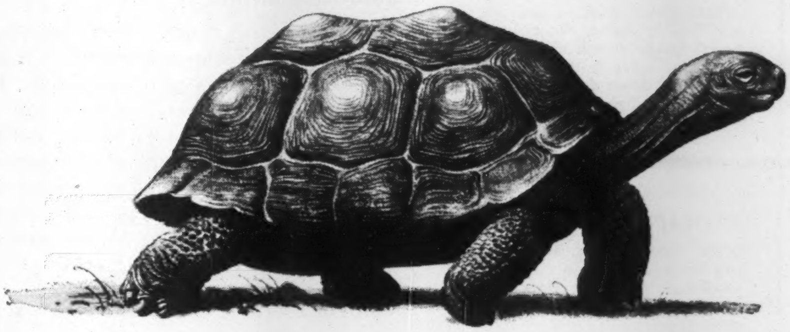
POWDER ACTUATED TOOL designed to drive heavy shank fasteners into structural steel plates up to an inch thick and into the hardest concrete. . . . The "Super-Power Jobmaster" is designed for either one hand or two hand operation and sets pins and studs 3/8 in. in thread or head diameter at an average rate of one or more a minute, the manufacturer states.

Manufacturer—Ramset Div., Olin Industries, Inc., 12117 Berea Rd., Cleveland 11, Ohio.

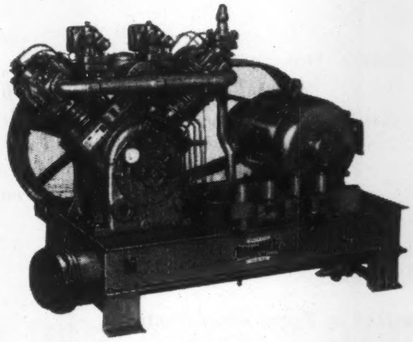
FIRE RESISTIVE weather protective coating, "Type 80 Mastic," has been given a listing by Underwriters' Laboratories. . . . The coating, according to the company, is anti-corrodant, a vapor barrier and a weather protective coating with a "built up film thickness."

Manufacturer—Benjamin Foster Co., 4635 W. Girard Ave., Philadelphia 31.

in air conditioning, too...



SLOW SPEED *means* LONG LIFE



BRUNNER CONDENSING UNITS

— for remote installation in commercial and industrial air conditioning applications are available in sizes up to 75 H.P. Brunner Compressor Units for use with evaporative condensers also available up to 75 H.P.

SELF-CONTAINED AIR CONDITIONERS

—completely packaged, easy to install and operate, are supplied in various models in sizes 2 H.P. to 20 H.P. — for residential and commercial use.

Why does the turtle live so long?

From an engineering viewpoint, the answer would probably be "Slow Speed!" Because the speed with which things *move* has a vital effect upon their life and usefulness, the design engineer is *always* concerned with doing *more* work with *less* motion.

Famous BRUNNER slow-speed COMPRESSORS are good examples of this principle. Because they operate at speeds much slower than other compressors of the same capacities, Brunner Compressors deliver full capacity air conditioning with *less* costly motion—*less* wear on working parts, *less* maintenance required — and *lower* operating costs, too.

That's *one* good reason so many architects and consultants specify Brunner equipment on every air conditioning job — for utmost dependability, economy and long-range customer satisfaction. There are *other* reasons, too — so why not get the complete Brunner story? See your Brunner representative — or write us.

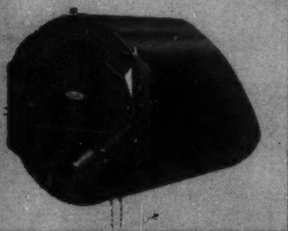
BRUNNER MANUFACTURING CO., Dept. L-54, **UTICA, NEW YORK**
The Brunner Co., Gainesville, Ga.
In Canada: Brunner Corp. (Canada) Limited, Toronto, Ontario

BRUNNER

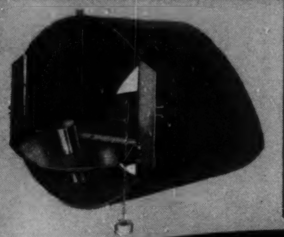
BRUNNER
SINCE 1906

means dependable

air conditioning



DOWN-DRAFT VIEW
Gate opens outward to relieve down drafts which might affect flame. An optional safety switch closes main gas valve in case of prolonged down draft, thus providing full protection.



UP-DRAFT VIEW
Gate opens inward to regulate updrafts in conventional, proven manner, checking any excess in draft.

field

"MG" Draft Controls
ENGINEERED SPECIFICALLY FOR

GAS
fired industrial and commercial plants

1. Double acting gate opens inward to regulate up-drafts and outward to relieve down-drafts.
2. Adding or taking off weights provides simple adjustment for up-draft conditions at time of installation.
3. Control will relieve internal or down-draft pressures of only a few thousandths of an inch.
4. Weights attached to gate itself are factory set to insure extreme sensitivity to down-draft conditions.
5. Corrosion resistant knife edge bearings resting on self-aligning bearing plates assure extreme sensitivity yet long life.
6. Side wings improve the regulation, making the control accurate at all gate positions.
7. Long collar keeps gate out of the path of flue gases — resulting in greatly increased life.

The Field "MG" has met the most rigid municipal requirements for commercial and industrial installations. It is being used with full approval of the nation's leading gas companies in the nation's largest cities. Fully safe, fully proven, it provides for gas-fired installations the same accurate, dependable performance, the fuel economy so long provided by Field Draft Controls for oil and coal fired furnaces. Write for complete information.

FIELD CONTROL DIVISION
of H. D. Conkey & Company — Mendota, Illinois
AFFILIATES: Conco Building Products, Inc. — Brick, Tile, Stone
Conco Materials Handling Division — Cranes, Hoists

RECENT TRADE LITERATURE . .

Cold-Aluminizing

A new bulletin includes a reprinted case history of a three year service application test to which "Kolmetal" coatings were subjected. This new product, consisting of pulverized aluminum in a plastic base, is applied without heat to equipment and storage tanks used by the chemical industries. The bulletin covers characteristics and applications, and also includes a table of recommended uses and application instructions.

Manufacturer—Emjay Maintenance Engineers, 327 Union Ave., Rutherford, N. J.

Control Motors, Motorized Valves

Catalog 8203 covers the complete line of the company's industrial control motors and industrial motorized valves. Included are specifications, ordering information and a price supplement for these motors. The catalog also contains information and specifications for the use of industrial control motors with globe, adjustable port, and butterfly valves, or combinations.

Manufacturer—Minneapolis-Honeywell Regulator Co., Industrial Div., Station 64, Wayne and Windrim Aves., Philadelphia 44.

Draft Control Handbook

A Handbook of Draft Control for Industrial Installations features the company's "BB" draft regulator, showing sizes available, dimensions and construction features. Selection charts are given and various tables show draft control capacities required for different breeching areas.

Manufacturer—Walker Mfg. & Sales Corp., 1740 Penn St., St. Joseph, Mo.

Dust Control in Paint Manufacture

How to control dust in the manufacture of paint is discussed in Bulletin No. 422. The illustrated bulletin gives case histories of four companies showing how dust conditions due to mixing, blending, crushing and grinding are prevented as a result of using local exhaust ventilation in which "Dustube" cloth-tube-type dust collectors are employed.

Manufacturer—American Wheelabrator & Equipment Corp., 1321 S. Brykit St., Mishawaka, Ind.

Finned Radiation and Covers

A 12 page illustrated color bulletin describes the firm's complete line of finned radiation and covers for commercial, industrial and institutional heating. General specifications, ratings and correction factor tables are included. Photographs show proper installation methods of finned radiation and covers.

Manufacturer—Bush Mfg. Co., 179 South St., West Hartford 10, Conn.

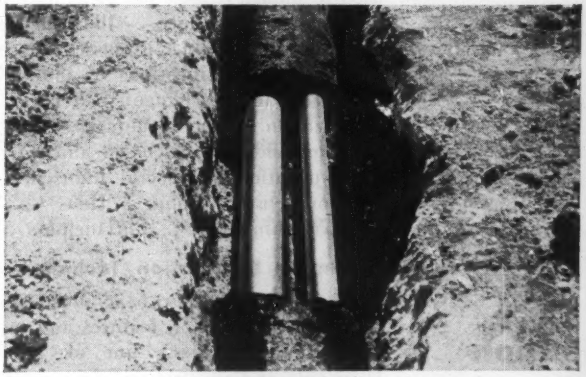
Flow Control

"Thermomatic," automatic, manual and thermostatic temperature controls for oils, gases, liquids and refrigerants are summarized in the booklet *Solve These Flow Control Problems.* Illustrated and outlined

3 Big Reasons Why

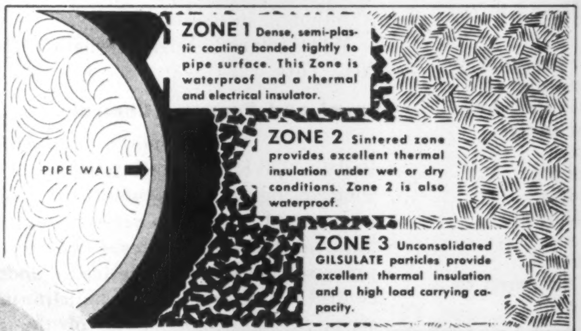
1. GILSULATE—Easy to install—Just pour it on, tamp it down and backfill. Run heat through the pipes (up to 520°F)...and the job is completed. No need to remove rocks from backfill; no problems of cramped space or multiple piping.

more and more hot underground pipe gets insulated



2. GILSULATE—Cost Less per Installed Linear Foot—No skilled labor needed... requires no mechanical sheaths, special protective devices, or costly installation procedures.

with new modern triple-zone GILSULATE®


ZONE 1 Dense, semi-plastic coating banded tightly to pipe surface. This Zone is waterproof and a thermal and electrical insulator.
PIPE WALL
ZONE 2 Sintered zone provides excellent thermal insulation under wet or dry conditions. Zone 2 is also waterproof.
ZONE 3 Unconsolidated GILSULATE particles provide excellent thermal insulation and a high load carrying capacity.

3. GILSULATE—Delivers Permanent Triple-Zone Protection—Three tough, massive circular sheaths completely and permanently protect the pipe, cut heat loss down to 8% to 11% of bare buried pipe. Triple-zone protects against all buried line corrosion conditions: water, roots, acid, alkalis, bacteria, etc.

Fill in coupon for complete details.

GILSULATE®

THE TRIPLE-ZONE INSULATION
FOR LIFETIME PROTECTION
OF HOT UNDERGROUND PIPES

AMERICAN GILSONITE COMPANY, SALT LAKE CITY, UTAH
Affiliate of Barber Oil Corporation and Standard Oil Company of California
Distributors in principal cities of United States and Canada

American Gilsonite Company
134 West Broadway
Salt Lake City, Utah

Please send me further information on GILSULATE

NAME..

TITLE..

COMPANY..

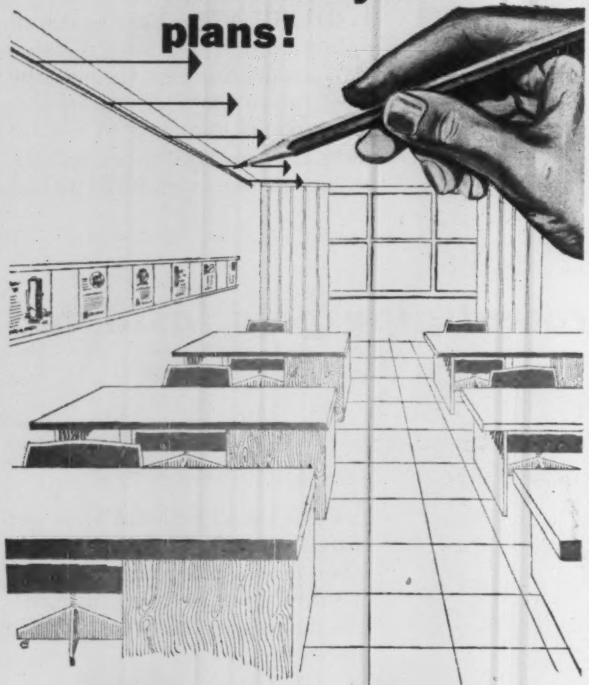
ADDRESS..

HPC

See how inconspicuously

STRIPLINE

fits into your plans!

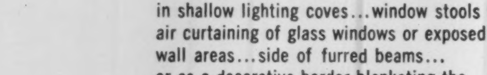


Unlimited air distribution provided by slender continuous diffusers ...another AGITAIR first!

Stripline diffusers offer complete application versatility. They are ideal for installation in shallow lighting coves...window stools for air curtaining of glass windows or exposed wall areas...side of furred beams... or as a decorative border blanketing the entire area with noiseless, draftless air distribution. Custom built with AGITAIR's patented diffusing vanes, Stripline diffusers create maximum mixing and aspiration... quick temperature equalization and correct air distribution over any desired length.

Write for your free copy of Catalog S-100 today.

AGITAIR STRIPLINE



AIR DEVICES INC.

185 Madison Avenue, New York 16, N. Y.

AIR DIFFUSERS • FILTERS • EXHAUSTERS

RECENT TRADE LITERATURE

Continued

with descriptions of applications, capacity data, outlet sizes, etc. are: single-unit "Gasapack" line for natural, manufactured or LP gas; oil flow control valves for space heaters or furnaces and gravity fed oil burners; thermostatic accessories, solenoids, water flow regulating valves, filters and driers.

Manufacturer—A-P Controls Corp., 2450 N. 32nd, Milwaukee 45, Wis.

Gate Valves

Condensed catalog, 107, covers iron body wedge gate valves. The bulletin describes service applications and gives details of construction. Various models are shown and working pressures are listed.

Manufacturer—Kennedy Valve Mfg. Co., Elmira, N. Y.

Industrial Water Treatment

A 24 page booklet titled *If You Use Water* explains the various water treatment processes used in industry, the equipment they require and the type of water they produce. Illustrated with two-color flow diagrams, the booklet discusses the fundamentals of the three major classifications of industrial water treatment based on ion exchange: softening, dealkalization and deionization. The advantages of the various water treatment methods are discussed and interpreted in terms of the applications in specific industries.

Manufacturer—Rohm & Haas Co., Resinous Products Div., Washington Sq., Philadelphia 5.

Insulation Installation Techniques

Four page illustrated instruction folder discusses construction features and installation techniques of the manufacturer's line of "Accordion" insulation. Diagrams and illustrations demonstrate how to install it between wood beams, steel beams and trussses, around ducts and pipes, on masonry walls, cement and wood floors and other shallow spaces. Also illustrated is "Multiple Aluminum" insulation.

Manufacturer—Infra Insulation, Inc., 525 Broadway, New York 12.

Level and Pressure Control

Chronoflo Level and Pressure Telemeter, Bulletin 230-K10, describes the application of "Chronoflo" telemetering to level control in reservoirs and elevated and ground storage; to pressure control in pump discharge lines, distribution systems, booster stations, industrial processes, steam and gas lines; and to automatic pump control. The eight page bulletin includes features, descriptions and illustrations of the transmitters and receivers, and diagrams of installation arrangements, with explanatory material on applications and operating features.

Manufacturer—Builders-Providence, Inc., 345 Harris Ave., Providence 1, R. I.

Magnetic Centrifugal Pumps

A magnetically driven centrifugal pump is described in a new four page bulletin. Known as the "Dynapump," this fractional horsepower pump is driven by a rotating magnetic field instead of a drive shaft.

Standard units are stainless steel for pumping most fluids. The bulletin describes the characteristics, specifications and performance of the pump.

Manufacturer—The Fostoria Pressed Steel Corp., Fostoria, Ohio.

Mechanical Flow Meter

Tilting U-tube mechanical flow meter is described in Catalog 1027. The meter has been redesigned to better conform to modern panel instrumentation. The catalog includes description of the operating principle, method of calibration and range change features. Close-up photographs illustrate the inside and outside of the meter. Complete information is given on capacities, pressures and materials of construction. A separate section includes drawings with dimensions and suggested installation methods.

Manufacturer—Penn Industrial Instrument Corp., 4110 Haverford Ave., Philadelphia 4.

Motor Frame Comparisons

Compar-A-Frame chart has been prepared to aid engineers and designers in comparing the old and new NEMA a-c frame standards. The single page chart shows comparative dimensions of open type and fan cooled type polyphase induction motors. There are charts for comparing frame sizes according to horsepower and speed, and a chart for comparison of dimensions of the old and new frames.

Prepared by—Reliance Electric & Engineering Co., 1088 Ivanhoe Rd., Cleveland 10, Ohio.

Oil Burner Controls

Bulletin GEA-6118 describes heating controls for oil burners. Especially written for oil burner dealers and servicemen, the two-color publication includes step by step installation photographs for the company's complete line of oil burner controls. It also provides information on the company's heating control exchange plan and promotional aids.

Manufacturer—General Electric Co., 1 River Rd., Schenectady 5, N. Y.

O-Ring Seals

A new 16-page brochure describes in detail the production and application of rubber "O"-ring seals. Included in the brochure are sections on end products, sizes, dash numbers and variable tolerances, dimensional data for installation of standard size "O"-rings, cross sectional drawings of correct and incorrect installations and methods of utilizing "O"-ring sealing properties.

Manufacturer—Minnesota Rubber and Gasket Co., 3630 Wooddale Ave., Minneapolis 16, Minn.

Package Air Conditioner

Bulletin C-1100-B49 introduces the firm's new package air conditioner. Features of the unit include nameplate concealed controls, lubricated fan, fan motor ball bearings and compressor, viscous type filter and accessories for directional air circulation and winter climate control. The bulletin illustrates parts and operation

For highest filtering efficiency wise birds select AGITAIR FM AIR FILTERS

High velocity...utmost efficiency

One-third less space required

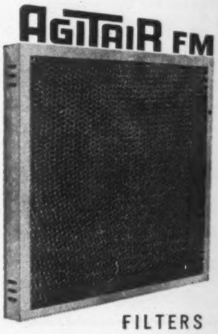
Lowest installation
and maintenance costs

Larger capacity

Longer life

Designed for an approach velocity of 530 fpm over the net media area, the high filtering efficiency of the AGITAIR FM increases as the dust load is applied. You save ⅓ in space required, in number of units to be installed and serviced. Very large dust-holding capacity of AGITAIR FM assures longer service periods, fewer cleanings per year, lower service charges. No exposed wire ends to cut or damage hands of service operators. Compare.

AGITAIR FM



Send today for free
Cost Comparison Chart.

AIR DEVICES INC.
185 Madison Avenue, New York 16, N. Y.

FILTERS • AIR DIFFUSERS • EXHAUSTERS

FLEXIFLO
recommends...
Alnor
VELOMETER
for Precision Air Flow Readings

Experience has taught the Universal Diffuser Corporation that the Alnor Velometer minimizes time required to balance an installation of Flexiflo diffusers. They *recommend* the Alnor Velometer because they know it consistently measures *actual* air flow precisely and quickly.

The Velometer is the *only* instantaneous, direct reading air velocity meter—accurate in all ranges, from high to low—compact, portable, easy to understand and use. Wide assortment of jets and fittings makes this precision instrument ideally suited for all air velocity measurement.

Get an Alnor Velometer for your air measurement needs. You'll save time and money wasted in balancing air distribution on your *next* installation. If you'd like a copy of Universal's instructions on balancing Flexiflo Diffusers with the Velometer, just send the coupon below.

Alnor

ILLINOIS TESTING LABORATORIES, INC.
Precision Instruments for Every Industry

PYROMETERS • VELOMETERS • DEW POINTERS • PYROCONS
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Illinois Testing Laboratories, Inc.
Room 513, 420 N. LaSalle St.
Chicago 10, Illinois
☐ Send Flexiflo Installation Manual
☐ Send Velometer Bulletin 2448

Name...
Company...
Address..
City...Zone......State..........

RECENT TRADE LITERATURE

Continued

factors of unit and five dimensions and capacities available.

Manufacturer—Worthington Corp., Harrison, N.J.

Relief Valves

Publication 5200 covers "Multiport" relief valves for steam, air and gas service. Charts, diagrams, tables and a number of examples of plant operating conditions are presented as illustrations to show how to select the proper valve. The publication also shows how the valve can be used as a differential pressure spill-over valve or as a check valve in closed steam, air or gas systems, or as a vacuum breaker.

Manufacturer—Cochrane Corp., 17th St. and Allegheny Ave., Philadelphia 32.

Stud Welding Equipment Chest

Specification sheet describes a portable steel chest designed to hold a complete set of the company's stud welding equipment. An illustration of the chest shows packing arrangement to transport a control unit, stud welding gun and accessories and miscellaneous equipment.

Manufacturer—KSM Products, Inc., Merchantville, N.J.

Temperature Regulators

Four page bulletin describes the design and operation features of the company's temperature regulators. The regulators feature a pilot, combining both a pressure and thermal element to change steam pressure for delivery according to demand requirements. A large cutaway diagram of a typical regulator with a description of construction and parts is presented. Recommended installations of the regulators for instantaneous water heaters, storage water heaters and forced air heating systems are shown in three line drawings.

Manufacturer—Spence Engineering Co., Inc., Walden, N.Y.

Volt-Ammeters

"Amprobe" Catalog No. 134 shows the firm's complete line of snap-around volt-ammeters, designed to measure current and voltage without shutting down equipment. Various models are shown for industrial plant use, for use by electricians and service men, and a multi-range unit for higher current requirements. Detailed specifications and features are included.

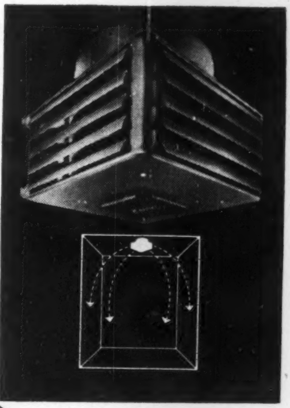
Manufacturer—Pyramid Instrument Corp., Lynbrook, N.Y.

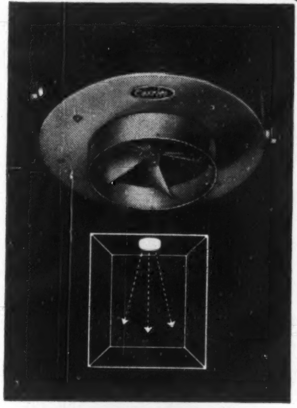
Wire Mesh Demisters

Copies of a paper, *Performance of Wire Mesh Demisters*, presented before a recent meeting of the American Institute of Chemical Engineers, now are available. The paper presents case histories from the chemical, petroleum and petrochemical industries which show how wire mesh demisters (a knitted wire mat mounted on a lightweight support grid) are being used to eliminate overhead losses, or increase the quality of the overhead product, while permitting operation at vapor velocities which would otherwise be excessive.

Prepared by—Otto H. York Co., Inc., 69 Glenwood Pl., East Orange, N. J., Att: Technical Librarian.

Carrier Engineered means





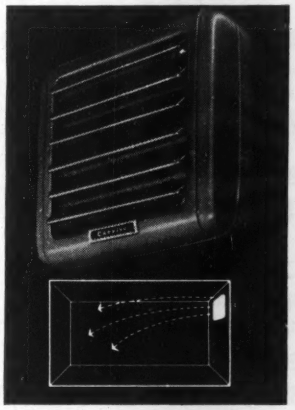
Quick Heat where it counts

...plus exceptionally long unit heater life

By nature, heat rises—toward the ceiling. But these Carrier engineered unit heaters take heat at a high transfer rate from their line-connected steam or hot-water elements, transform it into warmed air and force it *downward*—vertically or diagonally. They're simple, efficient, powerful—and easy to control in volume as well as direction.

CARRIER Four-way Directed-flo Unit Heater (upper). Through independently controlled warm air streams from four easily adjusted outlets and from heights up to 30 feet, this unit provides quick heat in any direction, at any angle, in any capacity within the respective ranges of its eight sizes—82,000 to 579,000 Btu per hour.

CARRIER Projection Unit Heater (lower). This single-discharge high-ceiling type unit with wide selection of outlet diffusers is available in seven sizes and a choice of coils for low or standard temperature rise. Capacities from 32,000 to 492,000 Btu per hour.



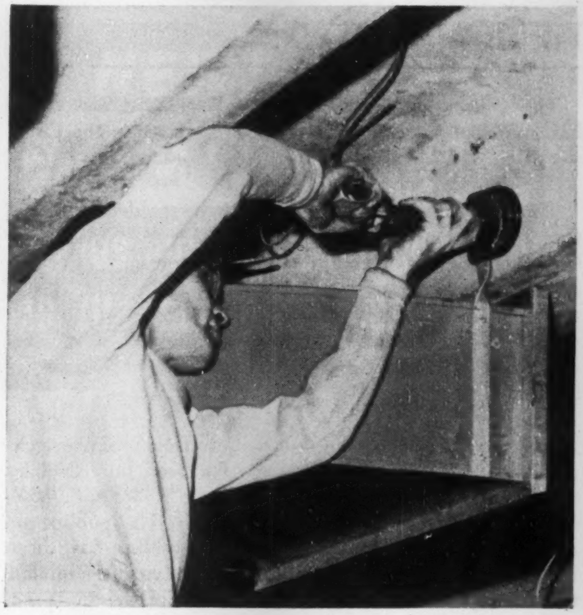
CARRIER Horizontal Air Discharge Unit Heater (right). Delivers warmed air horizontally through adjustable discharge louvres in any capacity within the respective ranges of its ten sizes of 21,000 to 200,000 Btu per hour.

CARRIER Gas-fired Unit Heaters (not illustrated) come in both propeller-fan and duct types. Solidly built—featuring exclusively **16**-gauge Aluminized Steel heat exchanger. Capacities range from 50,000 to 230,000 Btu per hour input.

For further information, WRITE Carrier Corporation, Syracuse, New York

Carrier

AIR CONDITIONING
REFRIGERATION
INDUSTRIAL HEATING



Ramset SAVES $11,000

FASTENING SYSTEM

for Fastening Air Ducts in Texas' Largest Store

More than two miles of air conditioning ducts were installed with RAMSET SYSTEM in the new addition to Joske's Department Store at San Antonio, Texas, the "largest store in the largest state."

By using RAMSET Jobmaster, anchoring studs were set at the rate of better than 1 per minute, instead of an estimated 15 minutes each by old-fashioned, conventional methods. Substantial cost savings were thus gained, as well as a far faster, completely secure installation. Similar results were obtained for hanging 13 miles of sprinkler piping and anchoring 43 miles of electric conduit.

Ramset Fasteners

Ask your dealer or write us for details on how you can make more profit from every job by using Ramset System.

SEE US AT WASHINGTON
IN BOOTH 147
N. A. P. C. SHOW
MAY 10 TO 13

Ramset Fasteners, INC.

Ramset Division, Olin Industries, Inc.
12109 BEREA ROAD • CLEVELAND 11, OHIO

FIRST IN POWDER ACTUATED FASTENING

AN Olin PRODUCT

WE HEAR THAT . . .

The contracting firm of *BAKER, SMITH & CO., INC.* has announced the opening of its new offices in the Chrysler Bldg., 405 Lexington Ave., New York.

The LaQuinta alumina plant of Reynolds Reduction Co., a wholly owned subsidiary of *REYNOLDS METALS CO.*, has been completed and is in operation. Located on the north shore of Corpus Christi Bay in south Texas, the plant has a rated output of 1000 tons of alumina daily. With the San Patricio reduction plant next door, it now gives Texas a completely integrated bauxite to aluminum operation.

Last March marked the one millionth copy of the technical books on arc welding that have been published by the *LINCOLN ELECTRIC CO.* and the *JAMES F. LINCOLN ARC WELDING FOUNDATION*. The publication and distribution of technical books on welding have been the core of the company's educational activity to stimulate the development and application of the arc welding process.

Scientists interested in problems concerned with the measurement of heat will gather in Schenectady, N. Y. next fall, when the ninth annual *CALORIMETRY CONFERENCE* meets at the General Electric Research Laboratory, September 17 and 18. *DR. WARREN DeSORBO* of the laboratory's metallurgy research department is program chairman.

An educational and research laboratory in oil hydraulics, said to be the most complete such facility in the United States, has been established at *ILLINOIS INSTITUTE OF TECHNOLOGY* in Chicago. The new laboratory offers a broad educational program ranging from intensive short courses to graduate level research.

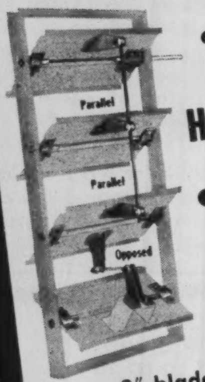
Stainless steel, in sheet, bar, wire and tube, has been added to the warehouse stocks of *CHASE BRASS & COPPER CO.*, a subsidiary of Kennecott Copper Corp. Early in April the firm began to merchandise stainless steel from its 27 warehouses and sales offices through an arrangement made with Crucible Steel Co. of America.

As part of a three-day sales meeting of the Industrial Div. of the *ARMSTRONG CORK CO.*, field representatives saw an exhibit of more than 250 uses of Armstrong's products in industry. The meeting was held at the home office in Lancaster, Pa.

Consolidation of sales and executive departments of the *JANITROL DIVISIONS* of *SURFACE COMBUSTION CORP.* with manufacturing and engineering units in Columbus, Ohio, has been announced. The sales and executive departments had been in Toledo. The Janitrol Heating and Air Conditioning Div. now is at 400 Dublin

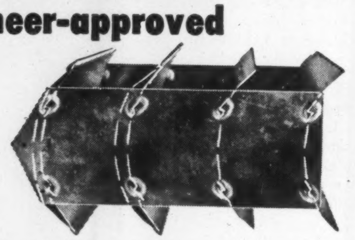
SAVE TIME, MONEY and MAINTAIN TOP QUALITY DURO-DYNE PRODUCTS

"DURO-BLADE KIT"
precision engineered
DAMPER HARDWARE



- Swiftest, simplest assembly
- Ideal for light or heavy dampers, 3″ blades or wider
- Corrosion-resistant throughout
- Parallel or opposed blade action
- Can be screwed, bolted, riveted, welded, spot welded

the original, job-tested
"DURO-VANE RAIL"
fast, accurate least expensive way to make engineer-approved
AIR TURNING VANES
Installed Cost cut 50% to 70%



- Complete turning Vanes meet engineering specifications
- For Hollow or single Air Turning Vanes
- Eliminates layout
- Supplied in 8′ lengths—200 ft. bundles

WRITE for Free new "Visual" Manual

DURO-DYNE CORPORATION
Dept. D, 800 3rd Ave. • New Hyde Park, N. Y.

Taylor controls Weather made by "Climate-Lab!"*

Both humidity and temperature are precisely controlled in the "Climate-Lab" test apparatus, developed and marketed by the American Instrument Company, Silver Spring, Md. The control system employs a Taylor Time Schedule Double Duty Recording Controller, whose control settings are varied automatically by shaped cams to produce various time, temperature and humidity programs. It also provides a minute-by-minute chart record.

This apparatus is equally adaptable to research, development or production. Among its many applications are: testing various types of equipment and containers; checking products destined for government use to insure compliance with specifications; testing packaging of food and other products for resistance to or retention of moisture; atmospheric corrosion studies; research on the effects of climatic conditions on seeds, plants, animals, etc.

Taylor has the instrumentation and the know-how to answer many tricky air-conditioning problems. Ask your Taylor Field Engineer or write Taylor Instrument Companies, Rochester, N. Y., or Toronto, Canada.

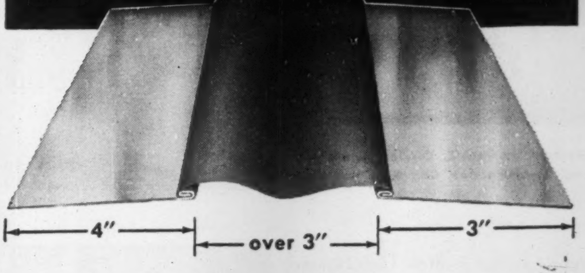
*TRADE-MARK PENDING

Taylor Instruments

MEAN ACCURACY FIRST

NEW! DURO METAL-FAB

makes quality flexible ducts up to 70% faster than old methods



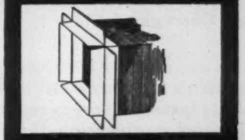
pre-assembled for you metal to fabric to metal!

ONE-PIECE FABRIC AND METAL DUCT CONNECTOR

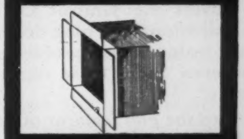
- For your protection, exclusive "Double-Loc" metal-to-fabric seam
- Fastest, simplest money-saving way to fabricate flexible duct connectors
- Wide metal edges ample to form all types of joints (clinch, flange, slip, etc.)
- Finest engineer-approved materials used throughout
- Required flat lengths quickly pulled from Dispens-o-Flat carton. (Packed in 100 ft. rolls)
- Stops vibration noise in furnaces • blowers • air conditioners • attic fans, etc.
- Duro Stapler eliminates costly sewing of fabric
- Available in U.L. approved Canvas, Asbestos, Neoprened Fiberglas

Write for DURO METAL-FAB Samples and Literature.

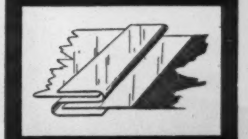
Typical types of connector made with DURO METAL-FAB



CLINCH COLLAR



FLANGE

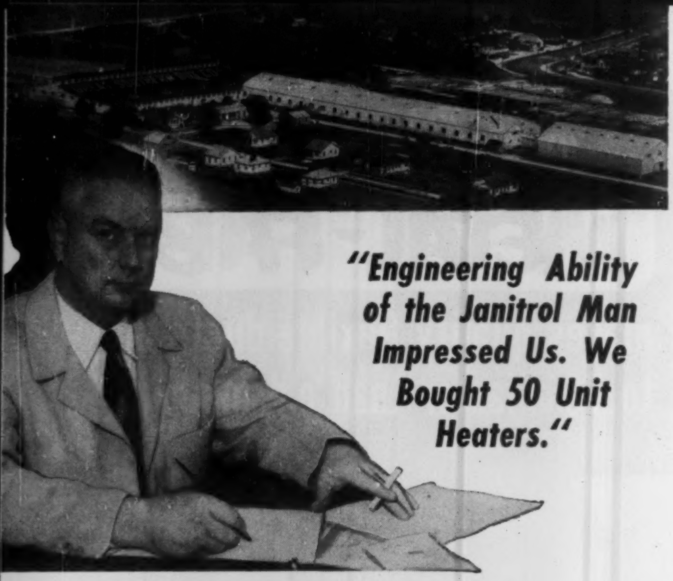


SLIP

PAT. PEND.
UNION
MADE

DURO-DYNE CORPORATION

800D Third Ave., New Hyde Park, L. I., N. Y.



"Engineering Ability of the Janitrol Man Impressed Us. We Bought 50 Unit Heaters."

Statement by Paul E. Olivier, General Supt.
Great Southern Box Co., New Orleans, La.

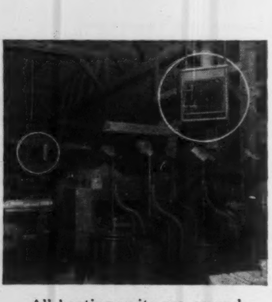
Starting with 8 Janitrol Unit Heaters in their Wirebound Box Plant in 1942 the Great Southern Box Co., Inc. found this a practical and economical answer for their heating problems. Janitrol gas units kept installation costs to a minimum . . . no costly steam pipes were needed.

Plant expansion in 1944 required 12 additional Janitrol units for the new Corrugated Section . . . and in 1946, 27 similar units were installed in their new plant in Jackson, Miss. Several units have also been installed in their Cleated Corrugated Plant in Jackson, Miss.

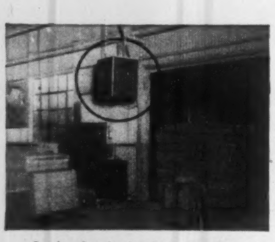
Mr. Olivier, said, "All of our heating requirements have been met with Janitrol Unit Heaters. There is no question that Janitrol engineering features assure long trouble-free service."

Sawdust in the air in the wooden box plant covers the Janitrol Units and makes occasional cleaning necessary—yet no maintenance problems have arisen, even under these rugged conditions!

Look into the *plus* features of gas heat with Janitrol for *your* needs!



All heating units are around the perimeter of the big 440′ x 90′ building.



Janitrol units in the paper box building cover eight shipping doors to provide a curtain of warm air during loading operations.

Janitrol
GAS-FIRED UNIT HEATERS

Write today for "The Business Man's Blue Book for Better Heating." It gives full details about unit heater performance and best installation practices.

Janitrol Division of
SURFACE COMBUSTION CORP.
400 Dublin Ave., Columbus 16, Ohio
In Canada: Alvar Simpson Ltd., Toronto 13, Canada

ALSO MAKERS OF
Surface INDUSTRIAL FURNACES **Kathabar** HUMIDITY CONDITIONING

WE HEAR THAT

Continued

Ave., in Columbus; the Janitrol Aircraft-Automotive Div. is at 366-390 Mount Vernon Ave.; and the "Kathabar" production facilities are at 270 N. Fifth St. The engineering and sales departments of this activity will remain in Toledo.

Nearly 75 men attended a five-day sales and engineering school conducted recently by *IRON FIREMAN MFG. CO.* at its Cleveland headquarters. Emphasis was placed on sales points, selling techniques and the most efficient methods of installing and maintaining equipment.

The *INTERNATIONAL METAL HOSE CO.* has completed its expansion program and is now operating from a new plant at 4445 Humboldt St., Detroit. Company officials state that the increased facilities and new machinery will enable them to produce in greater volume and to carry a service stock in all sizes.

The second group in a series of educational 35 mm sound slidefilms is now available through *ALLIS-CHALMERS* General Machinery Div. district offices. The three films are on the subject of v-belt drives; each runs about 20 minutes. They are titled *In Every V-Belt Drive, For Better Driving,* and *Selecting a Drive.* The first, in color, covers the engineering principles. The second concerns itself with the installation and maintenance of multiple v-belt drives. The third tells how to check characteristics to find the best type of drive and then engineer it.

A Veterans of Foreign Wars award has been given to the Robertshaw Thermostat Div. of *ROBERTSHAW-FULTON CONTROLS CO.* for its services to returning disabled war veterans and other veterans.

The first truckload of air conditioners from the new Decatur, Ala. works of *WORTHINGTON CORP.* was shipped last month to the Biggs Pump and Supply Co. in Lafayette, Ind. According to the company, this shipment was made 147 days after construction on the building was first started.

FRIGIDAIRE is conducting a series of meetings with its district organization sales managers, in which plans and programs for an intensive air conditioning sales drive are formed for the forthcoming selling season. The firm is planning a large promotional campaign in all media.

The *MARLEY CO.*, Kansas City, Mo., has built a new plant in Louisville to produce "Aquatowers," the company's line of mechanical draft cooling towers. Occupying 10 acres, it provides 77,000 sq ft of production space.

A new branch factory at 11710 E. Northwest Highway will double the Dallas facilities of the *FOXBORO CO.*

FLEXIFLO

THE DIFFUSER WITH A BUILT-IN VOLUME CONTROL

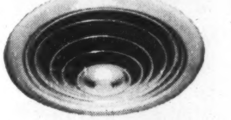
FLEXIFLO adjustable air diffusers reduce installation costs by providing for rapid, easy adjustment of air volume and pattern after installation by simple knob adjustment.

Engineering is simplified since the FLEXIFLO's wide range of adjustability provides wide latitude in selecting the correct size diffuser.

FLEXIFLO diffusers assure uniform air distribution with built-in equalizing deflectors which are easily adjustable *after* installation. Rapid draftless mixture of supply and room air is assured.

FLEXIFLO diffusers for every cooling, ventilating and heating need are made in 12 standard sizes, up to a capacity of 12,000 CFM.

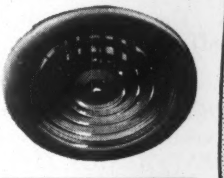
FOR COOLING



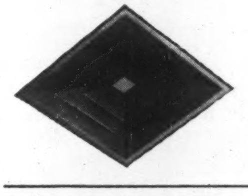
TYPE R—Air travels in a constant pattern parallel to the ceiling regardless of volume adjustment.

FOR COOLING & HEATING

TYPE V—Air diffusion pattern and volume are fully adjusable, after installation.



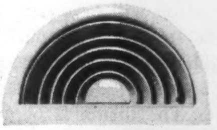
SQUARE



TYPE H—Fully adjustable square diffusers and fixed rectangular 2, 3, and 4 way diffusers.

FOR SIDEWALL & CEILING

TYPE S—With Type R or V blades to supply desired air pattern for ceiling or wall installation.



Write for technical data catalog on Flexiflo line

FLEXIFLO

Universal Diffuser Corp.
1350 Garrison Ave. • New York 59, N. Y.

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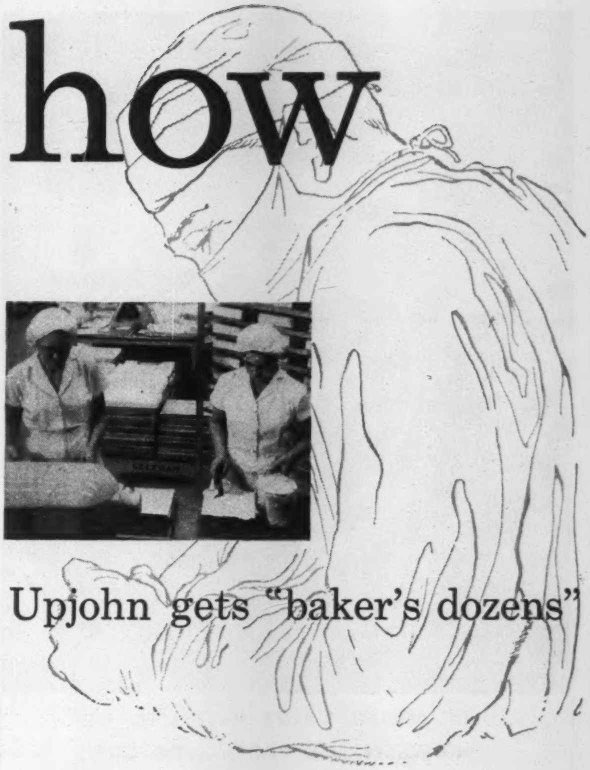
how



Upjohn gets "baker's dozens"

Air moisture — troublemaker in many processes — could play havoc in the processing of "Gelfoam," Upjohn's sponge-like material for the control of bleeding in surgery. Kathabar humidity conditioning helps provide Upjohn with *"baker's dozen" production* by delivering uniformly dry air to Gelfoam baking ovens — cutting drying time, saving fuel, and maintaining product quality and uniformity.

This is just one of the numerous instances in which Kathabar's direct dehumidification is cutting costs in the chemical process industries. Manufacturers of plastics, petrochemicals, pharmaceuticals, rubber, photographic film, military powders, and many other materials use Kathabar air conditioning for production, packaging and storage. Installations range up to more than one hundred thousand cfm in capacity.

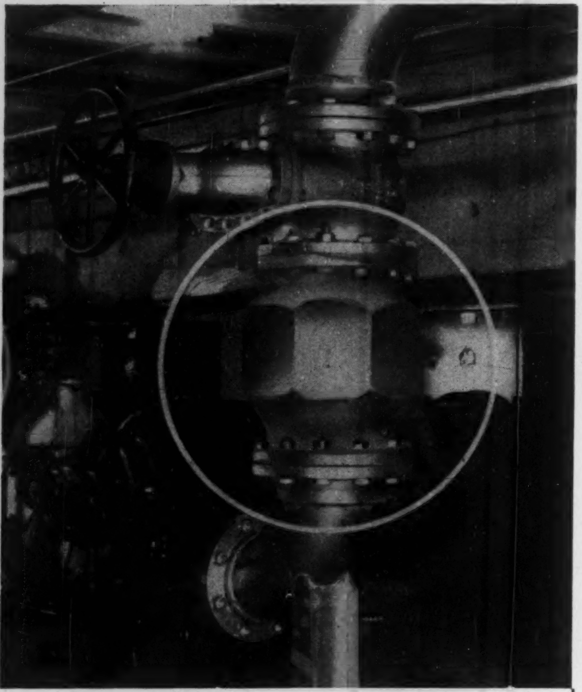
Look into Kathabar humidity conditioning now as a "straight line" to "perfect weather" production every day. Write for literature Group K-53-3, on your letterhead, please.

Kathabar
HUMIDITY CONDITIONING

SURFACE COMBUSTION CORPORATION, TOLEDO, OHIO

ALSO MAKERS OF

Surface INDUSTRIAL FURNACES **Janitrol** AUTOMATIC SPACE HEATING



10" MILLER VALVE INSTALLED IN MIDWESTERN DEPARTMENT STORE

MILLER

NOISELESS — NON-SLAM
CENTER GUIDED CHECK VALVE

SHOCK-PROOF
ELIMINATES WATER HAMMER

FULL RADIAL FLOW
MINIMUM PRESSURE LOSS
SIZES 1" THROUGH 24" FLANGED
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Please send your Bulletin 153 Descriptive of Miller Shock Proof Center Guided Check Valves.

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FIRM NAME ....
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WE HEAR THAT

Continued

Scheduled for occupancy this month, the new building will provide 13,000 sq ft of space for increased manufacturing activities, service and repair, and centralized warehousing of instruments and control valves, in addition to enlarged quarters for the sales office.

Acquisition of its third non-textile business, the *MB-MFG. CO.* of New Haven, has been announced by *TEXTRON INC.* The MB Mfg. Co. specializes in engineering and producing vibration equipment for planes, ships and guided missiles, as well as for air conditioning units, industrial machinery, building construction, etc. The present management is being retained.

TENNEY ENGINEERING, INC. now is carrying on full scale operations in its new plant at 1090 Springfield Rd., Union, N.J., devoted exclusively to the manufacture of environmental equipment. It is a one story, 30,000 sq ft building, on a seven acre site. Previous facilities had been in Newark.

Establishment of a national accounts sales unit has been announced by the Commercial Products Dept. of the *GENERAL ELECTRIC* Air Conditioning Div. The unit will provide a centralized purchasing contact for large national users of G.E. packaged air conditioners. *BERT NATKIN* will be manager.

THOR POWER TOOL CO. has purchased the *SPEEDWAY MFG. CO.* The company will continue with the same personnel at the Chicago plant, and under the same executive management including *WILLIAM B. SCACE*, president and *JACK R. DeBACHER*, vice president. The entire Speedway line will be marketed as "Thor SpeedTools."

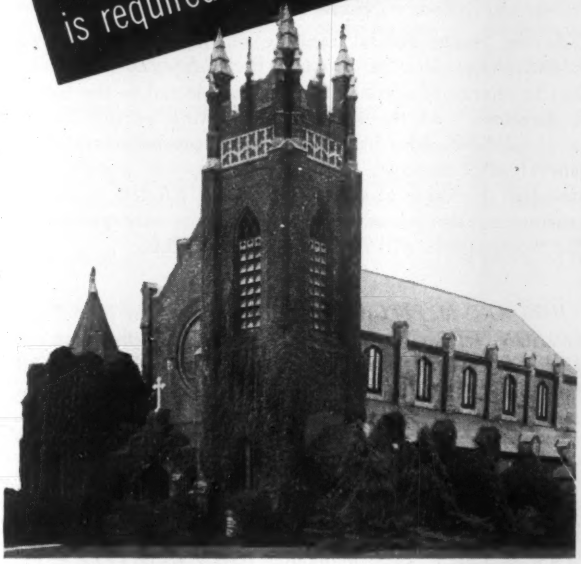
IDEN ASSOCIATES, manufacturers of fabrics for heating, ventilating and air conditioning, has changed its name to *VENTFABRICS, INC.* New address of the firm is 640 N. Kedzie Ave., Chicago 12.

What is believed to be the first industry-wide forum on problems caused by the increased demand for water in the United States will be held in Kansas City, Kans., on May 20 under the sponsorship of *FAIRBANKS, MORSE & CO.*

Experts in hydraulics from industry and the field of education will take part in the discussions on the nation's water supply, with particular emphasis on the latest research and development in pumps and general problems of the industry, both from the practical and the academic side. The forum is being held in connection with a four-day ceremony marking the opening of the new Kansas City pump works of Fairbanks, Morse.

Chairman of the day's activities will be Dean Francis M. Dawson, College of Engineering, University of Iowa. Dr. R. T. Knapp of the California Institute of Technology will head the forum section of the program.

When the best in *air conditioning* is required, specify *Ice-Cels*



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45 ton air conditioning system employing DOLE *Ice-Cel* Units—with 10 hp compressor

Ice-Cel Units are especially applicable for the air conditioning of churches — particularly parish halls, Sunday school rooms, the pastor's study, the sacristy and the sanctuary. Initial investment is small and operating costs are low.

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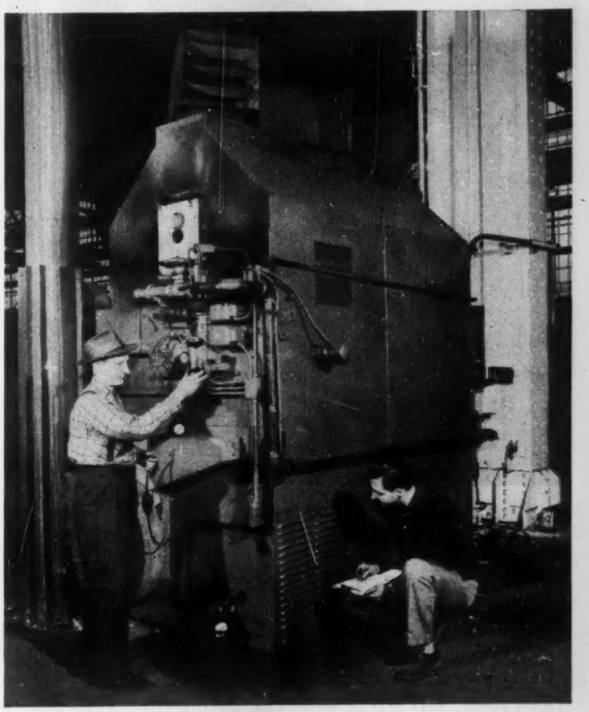

DRAVO Heaters give you 70% more life! ... the "17-year test" proves it!

Most industrial warm-air space heaters have to be replaced after eight to ten years of service. Not so with Dravo Heaters!

Dravo's Research Department tested a *Counterflo* Heater to determine mechanical and physical endurance. This heater was operated on an accelerated schedule equal to 17 years. That's 70% *longer* than the average life of a comparable type warm-air space heater. Metallurgical inspection of the stainless steel combustion chamber showed no appreciable physical deterioration. Minute inspection of component parts showed only normal expected use.

You get this 70% *extra life* from Dravo Heaters because of their engineered design and construction. Dollar for dollar and year for year of operation, your best heating investment is Dravo Heaters.

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DRAVO CORPORATION, Heating Department
Fifth and Liberty Avenues, Pittsburgh 22, Penna.

DRAVO

Please send me complete information about the Dravo:

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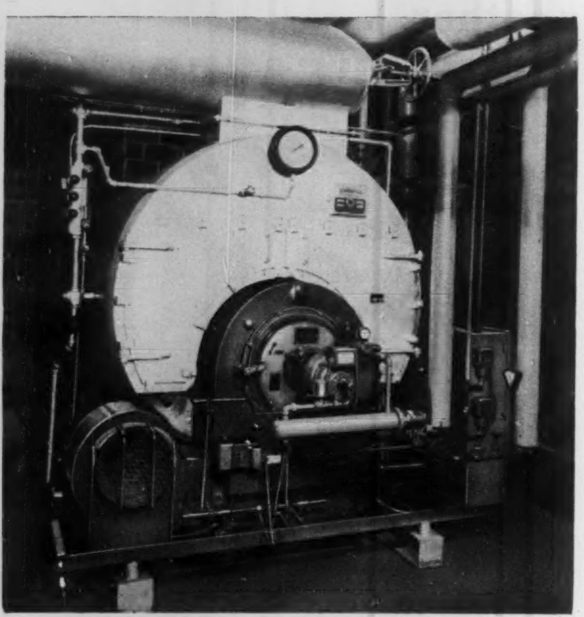

RAY Forced Draft 'Packaged' Burner Selected for Michigan School

HEMLOCK, MICHIGAN — The architectural and consulting engineer firm, the Warren S. Holmes Co., Lansing, Michigan selected the RAY Forced Draft 'Packaged' Oil Burner for installation in Hemlock Elementary School.

Initial combustion tests of the installation showed 13% CO_2 on high fire and 12% CO_2 on low fire with a stack temperature of less than 100° F. above the steam temperature according to the oil burner contractor, the Joseph M. Day Company of Saginaw, Michigan.

The Hemlock School installation was one of the first local applications of the Ray Oil Burner Co.'s new 'packaged' units which contain all the combustion components necessary for fully automatic operation on oil, gas or combination gas-oil factory wired, piped and mounted on a structural steel base, ready for installation on the boiler front.

Send for Catalog Unit Y

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SEE THE RAY FD COMBINATION UNIT
AT THE OHI EXPOSITION IN PHILADELPHIA

WHO'S WHAT . . .

The *MIDWEST STOKER ASSOC.* has announced the election of *P. I. BOHMANN*, regional manager, U. S. Machine Div. of Stewart-Warner Corp., as secretary-treasurer. He replaces F. H. Herndon, who resigned after selling his interest in the Herndon Sales and Service Co.

At the recent annual meeting of the shareholders of *FAIRBANKS, MORSE & CO., O. S. LESLIE*, vice president in charge of manufacturing, was elected to the board of directors. At the subsequent meeting of the board, *J. A. CUNEO*, who has for the past several years been general sales manager of the company, was elected vice president in charge of sales. *ROBERT B. CRAIG*, formerly assistant to the president, was elected a vice president. His headquarters will be in Washington, D.C.

HOWARD M. FITCH, general manager of the *HERMAN NELSON DIV.*, has been elected a vice president of *AMERICAN AIR FILTER CO., INC.* Mr. Fitch joined the firm in 1936 and has been manager of the division since 1953.

Key appointments to the staff of the *WESTINGHOUSE ELECTRIC CORP.'s* new Air Conditioning Div. at Staunton, Va. have been announced. Those named are: *WILLIAM B. COTT*, sales manager; *JOHN L. DITZLER*, engineering manager; *CLIFFORD M. SAYRE*, manager of manufacturing; *CHARLES E. SMOYER, JR.*, manager of accounting; *HAROLD L. GOEHRING*, industrial relations manager; and *JOHN C. FEICK, JR.*, purchasing agent.

M. C. TERRY and *LEONARD C. BASTIAN* have been promoted to new positions in the Appliance Div. of *PHILCO CORP.* Mr. Terry has been named executive engineer for air conditioning and Mr. Bastian has been named chief engineer for air conditioning.

HUGH GLEN has been elected president of *JOHNSTON PUMP CO.* He succeeds *MRS. THOMAS W. SIMMONS*, who has resigned as president but is still sole owner of the firm. Mr. Glen was formerly president of Emsco Derrick & Equipment Co.

JOHN F. MORTEN is marketing services manager of the equipment sales division of *RAYTHEON MFG. CO.* Before joining Raytheon, Mr. Morten was with Westinghouse.

ECONOMY PUMPS, INC., division of *C. H. WHEELER MFG. CO.*, has announced the organization of a Wheeler-Economy Fire Pumps Dept. under the direction of *J. U. ENGELBRINK*. Mr. Engelbrink formerly was with the Chicago office of Economy Pumps.

NEAL B. LAUBACH of Hudson Engineering Corp. has been elected president of the *COOLING TOWER INSTI-*

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Information on the purpose, cost, design, operation and maintenance of both process and comfort air conditioning systems in manufacturing plants of many kinds. The combined knowledge and experiences of 33 prominent engineers, every one a designer or in direct charge of the largest factory air conditioning systems in operation. This shows other engineers how air conditioning helps speed production, improve products, increase worker efficiency and operate systems economically. 186 pages, $1.50

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A practical manual on fume removal, dust collecting, ventilating and exhaust sysems for industrial plants. Tells how to design correctly and provide for various ventilation requirements . . . make measurements and analyses of fumes, mists and dusts . . . plan exhaust systems, etc. Twenty eminent authorities contributed also to detailed descriptions of systems in actual operation in many plants. 134 pages, $1.50

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Complete information on correct design, installation and operation of snow melting systems is offered in this reprint of articles originally published in "Heating, Piping and Air Conditioning." Design data based on a study of—and others' actual experience with—over 100 snow melting systems of all kinds. Applications illustrated, for loading platforms and docks; sidewalks; roads; driveways; marquees; parking areas; runways; railway switches, etc. 20 pages, $1.00

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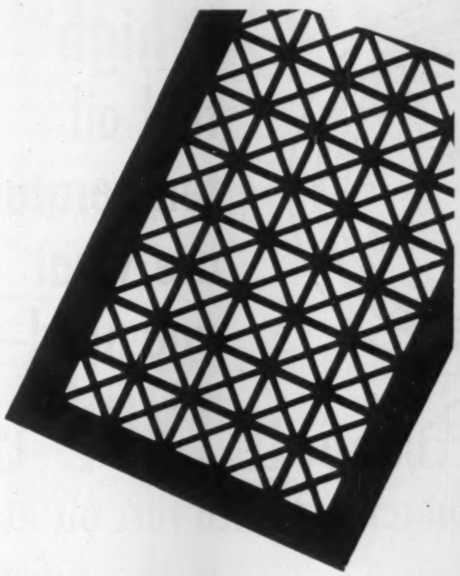

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if high fuel oil temperatures are what you need—the Paracoil TYPE "GF"*

INDIRECT GAS FIRED FUEL OIL HEATER is the answer!

With sub-water-line oil heaters, a low circulating boiler water temperature can play havoc with even the best engineered No. 6 oil burner layouts—particularly with the viscous oils now being used!

Our Type "GF" Indirect Gas Fired Heater can give you any desired oil temperature you want—without the use of expensive electric boosters!

APPLICABLE TO ALL TYPES OF OIL FIRED APPARATUS!

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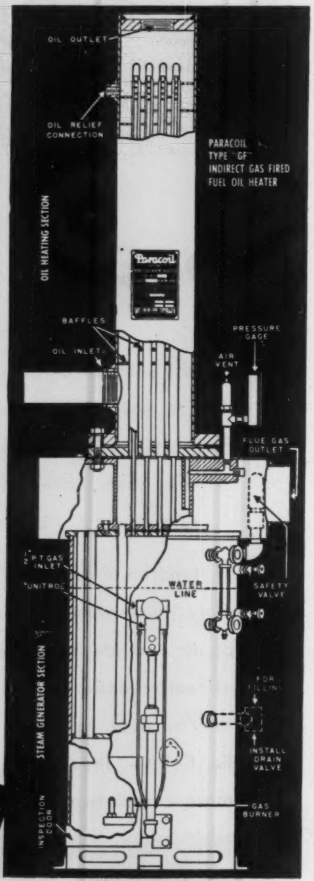
Completely factory assembled • Easy to install anywhere, even outdoors • Requires only minimum of floor space • Economical to operate • Wide range of oil heating capacities • Burns any specified type of gas fuel • High oil temperatures at all times • Operation unaffected by normal variation in viscosities of oils being heated.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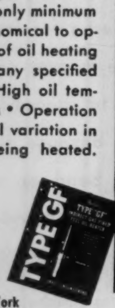
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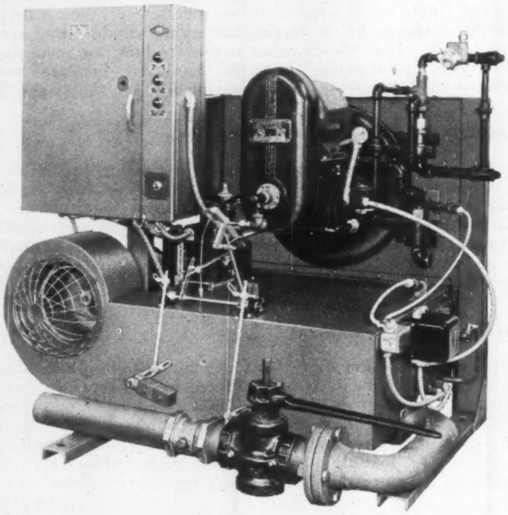
WEBSTER ROTONETIC*



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- ✓ **Sizes from 75 to 300 horsepower.**
- ✓ **Minimum gas pressure requirements.**
- ✓ **Low installation costs.**
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- ✓ **Utilizes all grades of fuel oil.**
- ✓ **Extremely low noise level.**
- ✓ **Approved electronic combustion safeguard system.**
- ✓ **Simpler changeover than ever before.**
- ✓ **One hundred per cent forced draft.**
- ✓ **Completely assembled, piped, wired and tested.**

These and many other outstanding features combine to provide the same dependable high quality performance as the WEBSTER DYNETIC gas burner. Neither fuel must suffer if the WEBSTER ROTONETIC is used. With integral pumps, integral oil preheaters for heavy oils, patented oil burner "flame-shaping" vanes, and full modulating or optional high-low control, the WEBSTER ROTONETIC is designed to provide long lasting customer satisfaction the year around.

It is furnished with a precast refractory front as an integral part of the burner assembly. The installer need only finish the furnace wall on each side and above the burner.

Listed by Underwriters' Laboratories, Inc.

TRADEMARK** ***Write for Literature

The WEBSTER ENGINEERING COMPANY
TULSA, OKLAHOMA
Division of SURFACE COMBUSTION CORPORATION, Toledo, Ohio

WHO'S WHAT

Continued

TUTE. He succeeds Leon T. Mart. Other new officers are: *PAUL R. HOFFMANN* of Lilie-Hoffmann Cooling Towers, Inc., vice president; *CLAYTON E. PICKUP,* The Fluor Corp., Ltd., secretary; and *ROBERT R. PABODIE,* United Cooling Tower Co., treasurer.

The *WRENTHAM CO.,* manufacturer's representative in New England and New York, has announced the appointment of *BERNARD SPIEGEL* as a vice president and director of the corporation. Mr. Spiegel will also assume the responsibilities of assistant general manager in his new position.

Announcement of new responsibilities for three of its operating personnel has been made by the *RELIANCE ELECTRIC & ENGINEERING CO. FRED E. HARRELL,* vice president, has been given the additional duties of director of special projects, a newly created position in which he will be concerned with new building projects and associated growth problems of the company. *HUGH D. LUKE,* formerly manager of central production planning, becomes manager of manufacturing of rotating equipment, and *STEPHEN W. FEISS,* formerly a manufacturing staff project engineer, now is general superintendent of the company's Ivanhoe Div.

GEORGE E. O'BRIEN, manager of purchasing and production for *ROCKWELL MFG. CO.'s* National Meter Div. for the past three years, has been named factory manager of the company's new water meter plant at Uniontown, Pa.

The firm also has announced the appointment of *TERRENCE H. M. TAYLOR* as chief engineer of the Nordstrom Valve Div. at Oakland, Calif. Mr. Taylor had been a research scientist with the Atomic Energy Commission.

WILLIAM G. GRAY has been appointed manager of railway sales for the *PYLE-NATIONAL CO.*

MARVIN W. BRANDAU has been promoted from industrial sales manager to director of market development of *AEROQUIP CORP.* Mr. Brandau joined Aeroquip in 1940 and has held various executive positions since that time. *W. F. ROGGE* replaces him as industrial sales manager.

New head of the research department of *COMBUSTION ENGINEERING, INC.* is *R. C. ULMER.* Dr. Ulmer joined the firm in 1953 and has been concerned with chemical problems of the Nuclear Energy Div. He succeeds B. J. Cross, who has retired. Mr. Cross has been appointed research consultant.

HERBERT BOSHEA has been named purchasing agent for the Bridgeport Thermostat Div. of *ROBERTSHAW-FULTON CONTROLS CO.*

Be Critical

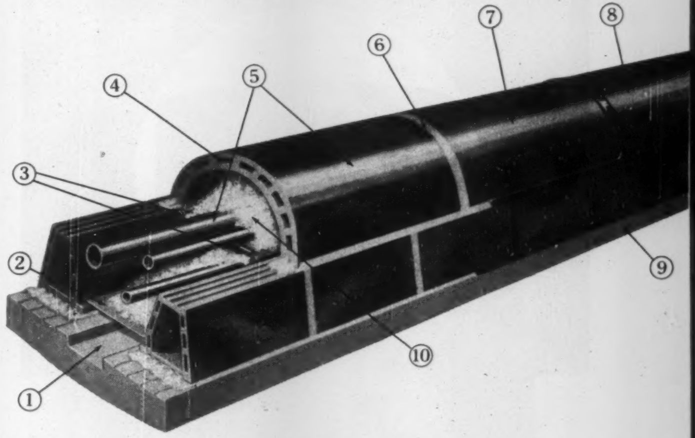
In the selection of an Underground Steam Conduit it is worth while to weigh every point. How long will it last? What is its efficiency? Will the efficiency endure throughout its entire life? Is it amply strong? Will the insulation be permanently dry? Is it easily installed? Can condensation pockets form due to sagging? How much will it cost?

By being critical in this way you will specify

Therm-O-Tile

REG. U.S. PAT. OFF.

UNDERGROUND STEAM CONDUIT



Referring to the diagram above, point by point: 1 — Drainage, entirely internal, assures permanently dry insulation. 2 — This separator plate supports the filler insulation. Not needed when sectional insulation is used. 3 — These pipe supports rest on the solid concrete base. 4 — Air channels increase efficiency. 5 — The piping and conduit are independently supported. No strain on the joints of the conduit when the lines are expanding in service. 6 — This waterproof mortar interlocks in channels and seals the joints. The exterior is smooth. 7 — Note the arched construction. Tests prove that the strength is greater than required by A.S.T.M. 8 — The conduit may be opened for pipe repair at any point without renewal of parts. 9 — This rigid 4-inch concrete base is poured directly into the trench bottom. No broken stone fill. No under-drain. Provides a convenient "sidewalk" for workers. 10 — This is "filler type" insulation. If desired, sectional pipe insulation is furnished.

Competitive in Cost. **Despite all the above advantages, Therm-O-Tile is competitive in total first cost.**

Ask for Bulletin 511. **It gives complete construction details, uses, and shows typical installations.**

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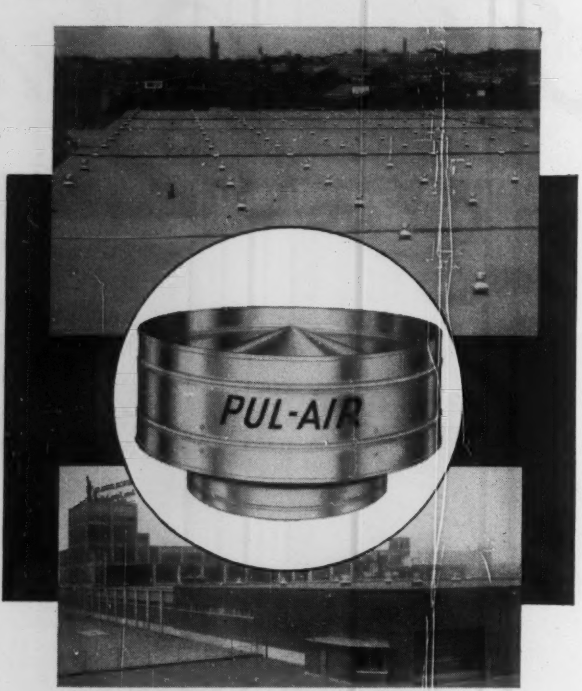

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ROBIN A. BELL has been named general manager of *JANITROL DIVISIONS* of *SURFACE COMBUSTION CORP.* Mr. Bell, general sales manager for Janitrol since 1949, will direct all sales, manufacturing and development operations for Janitrol Heating and Air Conditioning, Aircraft and Automotive divisions at the new Columbus, Ohio headquarters.

Stockholders of *FLEXONICS CORP.* have elected three new directors. They are *GEORGE R. BIRKELUND*, president of Baker, Fentress & Co.; *PERCY W. BOWERS*, executive vice president of Flexonics Corp. of Canada, Ltd., and *THOMAS K. WELLS*, general sales manager of Flexonics Corp.

A. J. DeFINO, vice president of Fedders-Quigan, was elected president of the *AIR-CONDITIONING and REFRIGERATION INSTITUTE* at its annual board of directors meeting held at White Sulphur Springs, W. Va., last month. He succeeds L. C. McKesson, vice president in charge of sales, Ansul Chemical Co.

JAMES EMMETT, JR., vice president of Jas. P. Marsh Corp., was elected vice president of the institute. The new treasurer is *M. M. LAWLER*, vice president of Worthington Corp.

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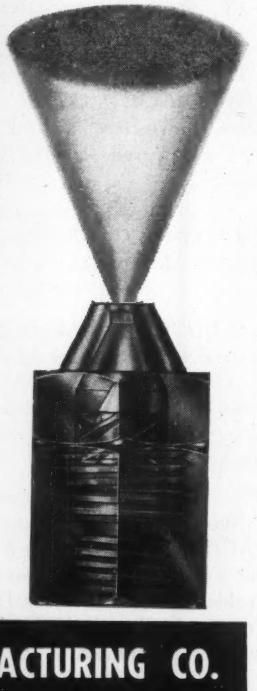
TYPE WSS SPRAY NOZZLE



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- **Brine Sprays**
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GRAND AVENUE & 4TH STREET
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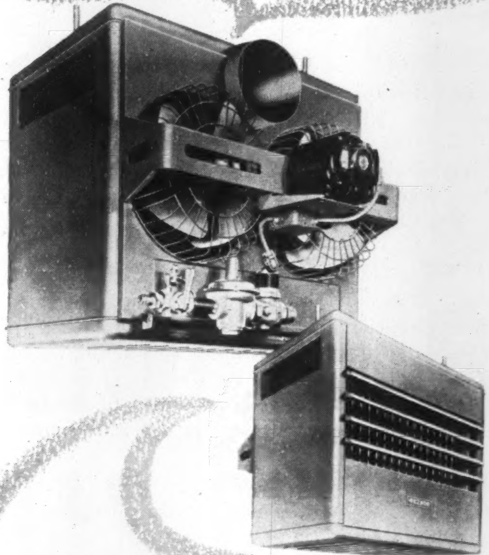
NEW-Reznor's 250,000 BTU twin-fan gas unit heater



a new solution for many industrial and commercial heating problems

Now you can use Reznor gas unit heaters on those big commercial and industrial jobs for which adequate equipment has never before been available. Reznor's 250,000 BTU gas-fired unit—the first of its size offered by any nationally-recognized unit heater manufacturer—is the heater you've been waiting for.

The twin-fan feature is new evidence of the engineering leadership which has made Reznor the world's largest-selling gas unit heater. The two fans, operating from a single heavy-duty 1/4 HP motor, provide more effective air distribution at a much lower noise level than could be obtained with a single larger fan. They move 3200 CFM with an air throw of 90 feet.

Despite its tremendous capacity and power, the new unit is amazingly compact. The cabinet is no higher than on Reznor's 175,000 BTU heater: 33½". The 250,000 BTU model is 36" wide and 40-3/16" deep overall; cabinet depth is 24⅝".

For more details on this revolutionary new heater, write today for your copy of specification sheet NPS-5401A. For the whole story on the complete Reznor line, ask for a copy of Catalog GN-52. **The Reznor Manufacturing Company, 51 Union St., Mercer, Pennsylvania.**

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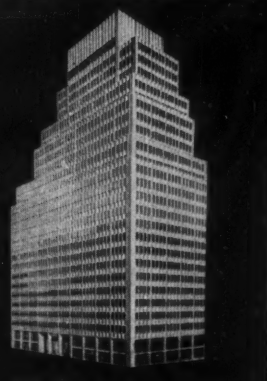
THE WORLD'S LARGEST-SELLING
GAS UNIT **HEATERS**

In 99 Park Avenue, the last word in most up-to-date building methods and materials, as in other of the nation's newest, most modern office buildings and industrial plants,

Fairbanks Valves fill the specs.

FAIRBANKS VALVES

Proven to give longer service under difficult operating conditions, proven lower in maintenance costs!



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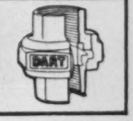

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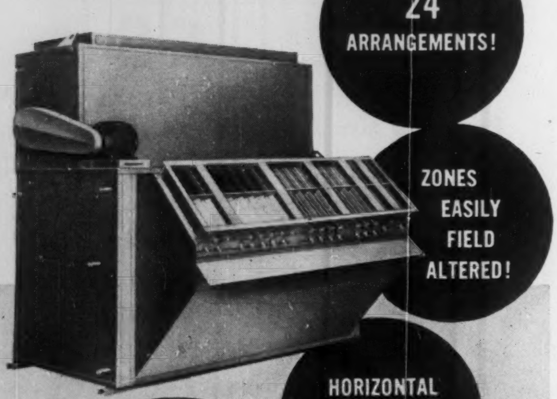
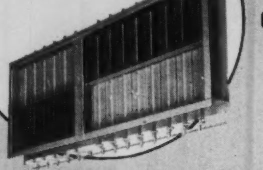


ZONES EASILY FIELD ALTERED!

HORIZONTAL OR VERTICAL DISCHARGE!

PLUS D-H EXCLUSIVE DAMPER ARRANGEMENT



Gives independent, variable control for as many as 7 separate zones

Flexibility—that's the *extra* you get with Flexazone! Only Flexazone can be assembled 24 different ways, depending upon available space—*in the field.* Only Flexazone allows you to add or change zones at any time—*in the field.* And only Flexazone gives you a choice of horizontal or angular air flow from the plenum. These *exclusive* features pay off in cheaper installation, greater design-freedom and lower costs—important benefits, whether you're a contractor, architect, engineer, or building owner!

Want to learn more about Flexazone? Write for bulletin C-4.22.

d-h SINCE 1910

drayer-hanson
INCORPORATED
3301 MEDFORD STREET, LOS ANGELES 63, CALIFORNIA

WHO'S WHAT

Continued

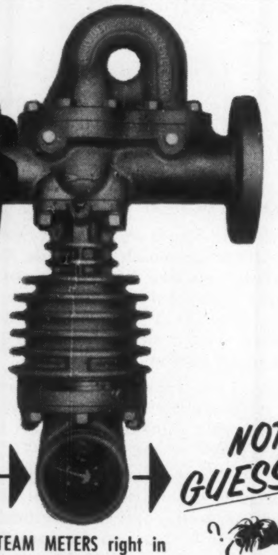
At the annual meeting of stockholders of *HAJOCA CORP., GEORGE W. DAY* was elected a director of the company, succeeding Stephen G. Duncan, who has retired. Mr. Day is sales manager of the manufacturing division of Grinnell Corp.

G. P. OLDHAM has been named general sales manager of *GUSTIN-BACON MFG. CO.*, succeeding *F. H. EBBERT*, vice president, who has been assigned other executive duties. Mr. Oldham, who will have responsibility for sales of the company's complete product line, had been general marketing manager for Kaiser Aluminum and Chemical Corp.

ELDON E. FOX, advertising manager of Minneapolis-Honeywell Regulator Co., has been named chairman of the advertising committee of the *PRODUCERS' COUNCIL, INC.*, a national organization of building products manufacturers. He succeeds Ray Dodge, of the Kawneer Co. The council functions as a source of information on building products and works for the improvement of building methods.

THOMAS L. ARNOLD now is sales manager of the Heating Div. of *FEDDERS-QUIGAN CORP.* Mr. Arnold previously served as sales manager of the heating division of the Bush Mfg. Co. and as general manager of the Vulcan Radiator Co.

pounds

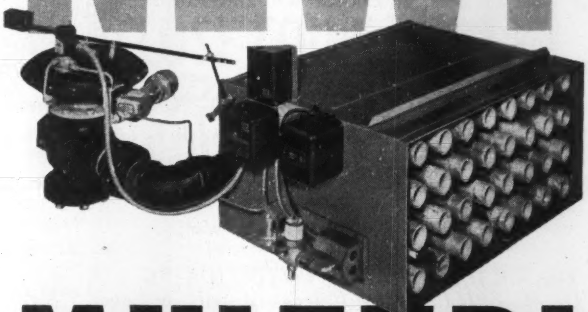


NOT GUESSES

Install BUILDERS SHUNTFLO STEAM METERS right in your steam lines. Keep track of steam costs by seeing where steam is going and how much. Shuntflo Meters available in Model SMKS (shown) for 2" to 14" lines — Model SMDH for 1" and 1½" lines. **Write for Shuntflo Bulletins. Builders-Providence, Inc. (Division of B-I-F Industries, Inc.), 381 Harris Ave., Providence 1, R. I.**

BUILDERS-PROVIDENCE
DIVISION OF B-I-F INDUSTRIES, INC.
BIF METERS FEEDERS CONTROLS

NEW!



MULTURI

(Multiple Venturi)

GAS BURNER

Especially designed for . . .

HARD-TO-FIRE

- **SCOTCH MARINE BOILERS**

HARD-TO-FIRE

- **STEEL FIRE BOX BOILERS**

AT HIGH FIRING RATES AT HIGH EFFICIENCY!

A Premix Type Gas Burner, ideal for commercial and industrial size boilers and warm air furnaces. Gives maximum performance from hard-to-fire Scotch Marine and steel fire box boilers. Flame characteristics make the burner a natural for units with extensive refractory surface. Suitable for any gas at 4" gas pressure or more. Permits high firing rates at high efficiency. Simple to install, adjust, and operate. Completely Factory Wired and Assembled . . .
Ready for Immediate Installation !

MULTURI BURNERS are available in standard modular units of 6 to 54 mixers. Capacities from 1,200,000 to 10,800,000 BTU/hr. Special units of higher capacities can be furnished. *Write or phone us for detailed information.*

Also Available — Nordensson Power Burners and Combination Gas-Oil Burners.

INDUSTRIAL GAS EQUIPMENT DIVISION
CODE OF ETHICS SIGNER
GAS APPLIANCE MANUFACTURERS ASSOCIATION
SIGNER NO. 32

ROBERTS-GORDON APPLIANCE CORP.
DEPARTMENT HPAC • BUFFALO 6, N. Y.
Conversion Gas Burners • Gas Heating Equipment

STOP Temperature Loss!

Grant Wilson DUX-SULATION with its K factor of .27 BTU, saves 3 out of 4 degrees of temperature which are otherwise lost. *In heating,* DUX-SULATION gets more heat from the source to the register at greater fuel savings. *In Cooling or Air-Conditioning,* DUX-SULATION prevents heat gains . . . delivering proper air output with minimum operation of any system's equipment: compressors, motors, turbines, valves, pumps. Power, water and repair costs are lowered . . . overload on refrigeration equipment relieved.

Other Advantages of Dux-Sulation on Duct Work: Condensation Prevention, Sound Absorption, Lower Surface Friction, Permanence, Good Appearance, Economy of Installation, Dependable Safety.

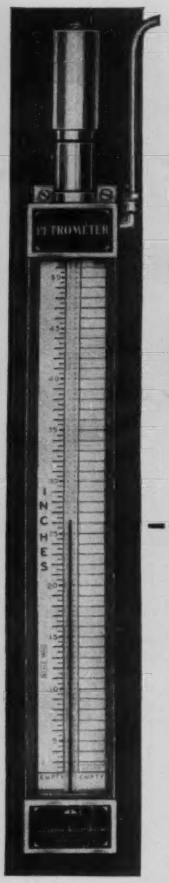
STOP Noise!

Grant Wilson Woven Asbestos FLEXI-DUCT Tape stops noise and vibrations in all duct systems by isolating them at their source. Mechanical rattles, starting and stopping screeches, shaft whine, fan hum . . . all natural attendant noises to a blower's operation . . . can be confined to the blower housing by incorporating a flexible joint made of FLEXI-DUCT tape. Installation of such a joint is simple . . . tape or bolt FLEXI-DUCT to equipment and duct work with little time and effort. Network of ducts can be easily sectionalized . . . positively precluding sound travel by conduction . . . by interspersing FLEXI-DUCT joints throughout.

USED IN ***STORES • OFFICES • HOSPITALS • THEATRES • INDUSTRIES • HOMES***

Write Today for Free Sample Kit (No. 545-H)

Grant Wilson inc.
ASBESTOS and INSULATING MATERIALS
141 WEST JACKSON BLVD • CHICAGO 4, ILLINOIS



PETROMETER
REMOTE READING
LIQUID DEPTH
GAUGES

"Bring Your Liquid Level to Eye Level"

THE BEST GAUGE FOR:

Commercial and Industrial Fuel Oil Storage Tanks

Domestic Installations with Buried Tanks

Storage Tanks for other Industrial Liquids—gasoline, solvents, acids, etc.

HERE'S WHY:

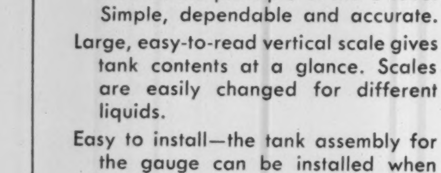
Can be installed on tanks above or below the ground and up to ¼ of a mile away.

No troublesome moving parts—operates on the principle of the U-tube. Simple, dependable and accurate.

Large, easy-to-read vertical scale gives tank contents at a glance. Scales are easily changed for different liquids.

Easy to install—the tank assembly for the gauge can be installed when the tank is empty or when containing liquid. It can also be installed separately to complete the tank work. The gauge can be connected any time later. Only one simple connection to tighten.

WRITE FOR BULLETIN PH TODAY.



FOR TANKS 20 INCHES TO 50 FEET DEEP.

LIQUIDEPTH INDICATORS, INC.
43-22 TENTH STREET
LONG ISLAND CITY 1, N. Y.

WHO'S WHAT

Continued

ANDREW F. WARD has been appointed staff assistant to M. M. Lawler, vice president of air conditioning and refrigeration, *WORTHINGTON CORP.* Prior to joining Worthington, Mr. Ward was general sales manager of the Williams Div. of Eureka Williams Corp.

IN THE TERRITORIES . . .

For the *LINCOLN ELECTRIC CO.*—New application engineers added to the field staff are *JACK JASO*, who has been assigned to the Chicago district; *WALTER ROCKWAY*, Cincinnati; and *CHESTER SHIRA*, Jacksonville, Fla.

For *GRAVER WATER CONDITIONING CO.*—*DAVID M. SPILLANE* is Chicago district manager. Mr. Spillane was New New York sales engineer for the company prior to the new assignment.

For *PREFERRED UTILITIES MFG. CORP.*—*H. A. PIETSCH CO.*, 894 Heckler Dr., Pittsburgh, is sales and engineering representative for the firm's line of unit steam generators in western Pennsylvania, West Virginia and eastern Ohio.

For *AIRTHERM MFG. CO.*, Heating Div.—*J. C. WATKINS* is manager of the Eastern Div. and *R. W.*

Monarch
NOZZLES
for
HUMIDIFYING

Monarch Brass F-80 Air Conditioning Nozzles (or ¼" male one-piece H-261 style) produce the finest possible breakup of small capacities with low direct pressure only. No air required.

The most popular size is #3.00 which operates on as little as 25 pounds pressure, delivers 1.00 gph and produces a very wide angle of spray (120°) in a fine, soft, fog-like mist.

Available in 25 different capacity sizes from .57 gph upwards, all Brass construction with 120 mesh Monel screen strainers.

WRITE FOR CATALOG 6-A

MONARCH MANUFACTURING WORKS, INC.

2523 E. Ontario St. PHILA. 34, PENNA
CANADIAN SALES AGENT (EXCEPT B.C.) CANADIAN GENERAL FILTERS LTD., 2679 DANFORTH AVE., TORONTO 13.

They SELL! They PLEASE!

AURORA

CLOSE-COUPLED

Packaged

AIR CONDITIONING PUMPS

for
EVAPORATOR COOLING TOWERS
•
AIR CONDITIONING UNITS
•
also for
GENERAL SERVICE

These are outstanding pumps, high in favor with air conditioning contractors and manufacturers of air conditioning equipment. Mechanical seal requires no packing or maintenance. Disassembly without disturbing pipe connections or hold down bolts.

- LOW COST
- SMOOTH, QUIET
- DEPENDABLE
- LONG LIVED
- MECHANICAL SEAL
- DISASSEMBLY is QUICK, SIMPLE
- CARRIED IN STOCK

AURORA PUMP CO

Capacities up to 150 G. P. M., Heads to 100 Ft.

Aurora Type JMC Pump — Close-Coupled

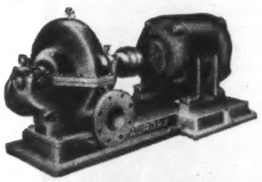
CASINGS vertically split. Casing wearing ring standard.

MECHANICAL SEAL—standard, located in packing cover.

IMPELLER — balanced, enclosed type, high grade bronze.

MOTOR—NEMA specs., stainless steel shaft on JMC — for all circuits and various enclosures.

BALL BEARINGS — on JMC, built into motor.



OTHER AURORA AIR CONDITIONING UNITS

We are also in a position to supply various sizes of air conditioning pumps in V-Belt drive, and flexible coupling drive. Our large size type G.M.C. Close-Coupled Pumps can be furnished up to 800 G.P.M. and heads to 200 ft.

ALSO — AURORA SPLIT CASE CENTRIFUGAL PUMPS

—single and two stage for water supply, handling condenser circulating water, brine circulation, booster service and many other duties.

Complete Information on Request

DISTRIBUTORS IN PRINCIPAL CITIES

AURORA *Always* PUMPS

AURORA PUMP COMPANY

Division of the New York Air Brake Company

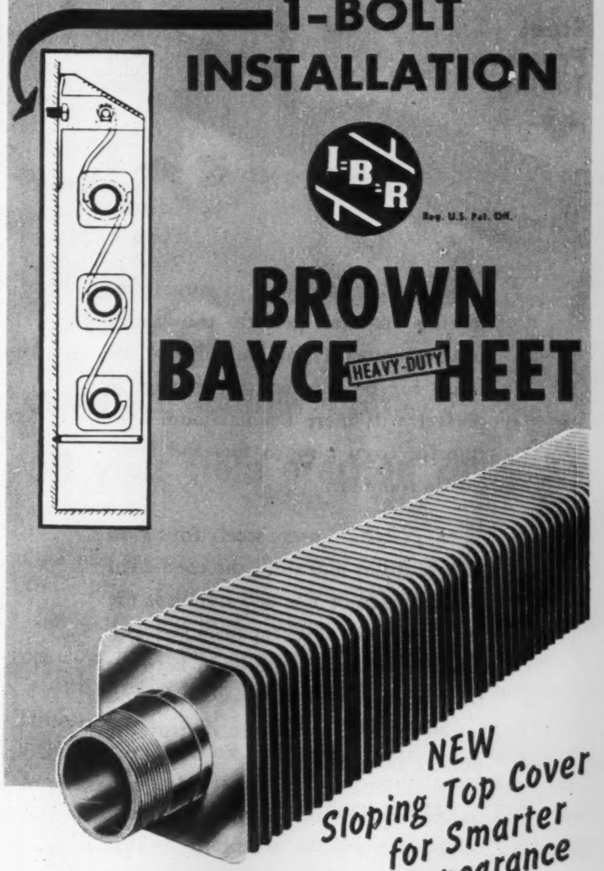
80 Loucks Street
Aurora, Illinois

EXCLUSIVE

1-BOLT INSTALLATION

I=B=R Reg. U.S. Pat. Off.

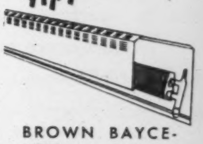
BROWN BAYCE HEAVY-DUTY HEET



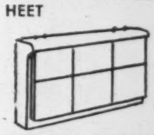
NEW Sloping Top Cover for Smarter Appearance

Contractors acclaim BROWN Heavy-Duty BAYCE-HEET "Easiest, Most Economical to Install." New movable 'S' hooks eliminate as many as four lag bolts. Most contractors figure $1.00 installation cost per lag bolt . . . save a lag bolt and you save a dollar. If the fintube you now use requires 4 lag bolts, you save $3.00 by switching to BROWN Heavy-Duty BAYCE-HEET.

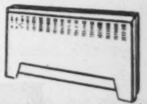
Records of every-day jobs show installation savings averaging 10% with BROWN Heavy-Duty BAYCE-HEET.



BROWN BAYCE-HEET



BROWN AIR CONDITIONERS

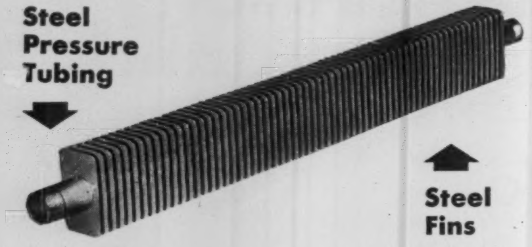


BROWN-HEET CONVECTOR UNITS

Write for our I.B.R. Catalog Ratings in Bulletin 300-1

BROWN PRODUCTS COMPANY
FOREST HILLS, NEW YORK

STEEL TO STEEL KEEPS FINS TIGHT



Maximum efficiency in finned radiation requires perfect, continuous contact between fins and pipe at all times for only when this contact is perfect will there be maximum heat transfer from pipe to fins and from fins to room air.

AUTORAD uses steel for *both* tube and fins and since the coefficient of expansion of fins and tubing is the same, no amount of expansion or contraction can lessen the bond between them and decrease heat transfer. And no electrolytic action can destroy the perfect bond.

AUTORAD has developed a method of bonding fins to tubing so that the resulting contact is as firm and perfect as a welded joint. As a consequence heat transfer is kept at peak efficiency.

To you as a contractor this means long years of customer satisfaction and customer satisfaction means greater profits to you.

Ask for complete data and prices.

AUTO-RAD Inc.

3535 Fillmore Street, Chicago 24, Illinois

WHO'S WHAT

Continued

BROWNE is manager of the Western Div. Mr. Watkins' new headquarters are at 135 Greenwood Ave., Jenkintown, Pa. Mr. Browne, who has managed western sales of the Machinery Div. since 1952, will operate from his present office at 190 McArthur Blvd., Oakland, Calif.

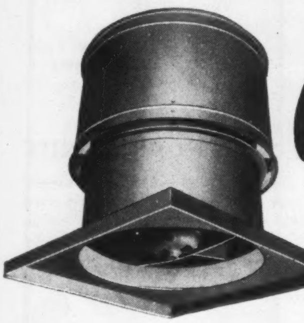
For *REYNOLDS METALS CO.*—New distributor of aluminum mill products is *INDUSTRIAL METALS, INC.*, 410 S. W. Boulevard, Kansas City, Mo.

For *UNION ASBESTOS and RUBBER CO.—FRED THUEMLING CO.*, 312 E. Wisconsin Ave., Milwaukee, has been appointed sales representative for heating and air conditioning units. The Thuemling company will represent "Unarco's" heating and cooling division in the middle and eastern two-thirds of Wisconsin and Michigan's upper peninsula.

For *DELTA HEATING CORP.—E. S. CUSHING* is the sales representative for the New England area. Mr. Cushing will make his headquarters in Reading, Mass.

For *CONOFLOW CORP.*—Exclusive representative in the New York area is *CYBERNO PRODUCTS CO.*, 30 Church St., New York. The company will cover metropolitan New York, northern New Jersey and Connecticut.

For removing a LARGE VOLUME of Fumes or Air at HIGH VELOCITY



allen VERTICAL DISCHARGE FAN

Whenever you face the problem of discharging fumes or vapors through a roof ventilator so that they will not short circuit back through building openings, you'll find the solution in this new Vertical Discharge Fan. It is designed especially for industrial applications that require the removal of a large volume at high velocity. The "VD" roof fan is fabricated of zinc-coated iron sheet with welded construction throughout. Automatic wing dampers open with air blast, close weathertight when not operating. The "VD" is available as direct drive with motor mounted inside air stream or as "VDR" with motor mounted outside throat of ventilator. Either type is available in a wide range of capacities and sizes.

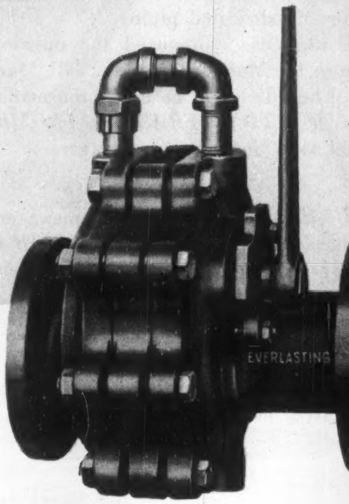
Write for catalog on complete line of roof ventilators.

ALLEN ENGINEERED VENTILATION

PRODUCTION PLANNING CO.
ROCHESTER, MICHIGAN
Roof Ventilators for Every Commercial and Industrial Need

VISCOUS MATERIALS

flow freely through these valves



Do you handle resins, asphalts, coal tar products, waxes or any other products that congeal at ordinary temperatures?

If so, EVERLASTING Steam Jacketed Valves will definitely end your clogging problems caused by other types of valves.

Users report that even in particularly difficult services, such as molten sulfur, these EVERLASTING Valves operate satisfactorily, after replacing other designs of valves that caused continuous trouble.

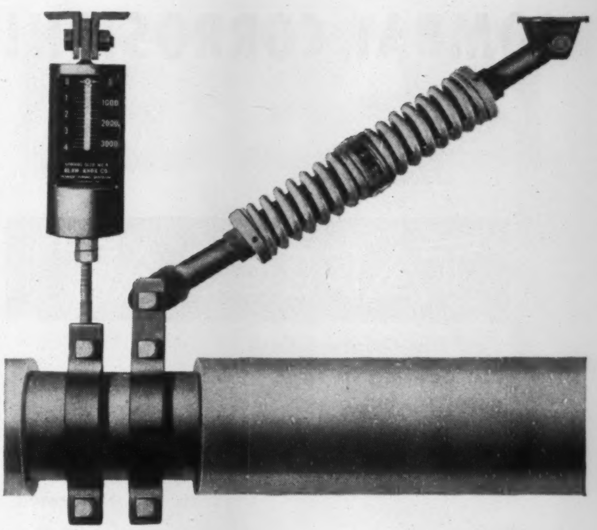
The secret is in the exclusive EVERLASTING design of steam jacket and operating mechanism. *For complete explanation write for descriptive bulletin.*

EVERLASTING VALVE CO., 61 FISK STREET, JERSEY CITY 5, N. J.

Everlasting Valves

FOR EVERLASTING PROTECTION

EV376 TRADE MARK "EVERLASTING" REG. U. S. PAT. OFF.



complete hanger units cut your field erection costs

One sure way to cut your field erection costs is to use Blaw-Knox hangers and eliminators. Each is a complete packaged unit, ready to install. No expensive cutting, threading and assembling on the job.

And you'll also save on engineering and specifying time.

Each Blaw-Knox functional spring hanger, rigid hanger assembly, overhead roller assembly, and vibration eliminator is designed for a specific purpose. Constructed to conform with the "code for pressure piping." Available in types and sizes to meet varying conditions.

BLAW-KNOX
PIPE HANGERS
SUPPORTS
VIBRATION ELIMINATORS

Any time you'd like some help, our experienced engineers are available to both design and make recommendations for your hanger requirements. Send for your copy of Bulletin No. 54 to get complete information.

BLAW-KNOX COMPANY, Power Piping and Sprinkler Division, Pittsburgh 33, Pa.

BLAW-KNOX PIPE HANGERS

Complete line of functional spring hangers • rigid hanger assemblies • overhead roller assemblies • supports • vibration eliminators . . . plus complete prefabricated power piping systems for all pressures and temperatures.

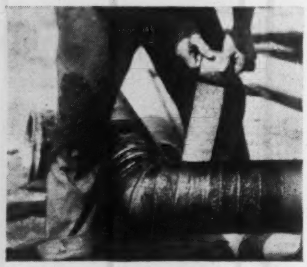
COMBAT CORROSION!

Specify

TAPECOAT®

. . . the Original Coal Tar Coating in Tape Form for Pipe, Pipe Joints, Couplings and Tanks

TAPECOAT is a coal tar coating with a tar-saturated close-woven fabric as a carrier for speed of application. The coal tar is self-bonding and requires no foreign adhesives.



Because coal tar is nature's own protection against corrosion, TAPECOAT resists moisture, acids, alkalis, soil stress, electrolysis, chemical fumes, fly ash, salt water, salt-laden air, barnacles, and other severe corrosive and abrasive conditions above and below ground.

TAPECOAT is clean to handle and easy to apply by spiral or "cigarette" wrapping with the use of a torch to bleed the coating to insure a continuous bond. It cuts maintenance and replacement costs.

TAPECOAT is sized to the job—comes in rolls of 2", 3", 4", 6", 18" and 24" widths to meet specific requirements on pipe, pipe joints, couplings, tanks, cable, conduit and other vulnerable steel surfaces.

PROVED IN SERVICE SINCE 1941

TAPECOAT has proved its dependability over the years in serving gas and oil companies, railroads, telephone companies, air lines, shipbuilders and operators, water and sewage works, chemical and industrial plants, engineers and contractors . . . providing continuing protection against corrosion.

Write for descriptive brochure and prices.

The TAPECOAT Company

Originators of Coal Tar Tape Protection

1555 Lyons Street, Evanston, Illinois

WHO'S WHAT

Continued

GEORGE M. SEBREE and *JAMES M. HUFF* have formed the *SEBREE-HUFF EQUIPMENT CO.*, manufacturer's representatives, Albuquerque, N. Mex. Mr. Sebree has operated his own concern for the past seven years and Mr. Huff was formerly branch manager in Albuquerque for Western Air & Refrigeration, Inc. Among the lines handled by the firm are Clarage Fan Co., Marlo Coil Co., the Gallaher Co., C. H. Wheeler Mfg. Co. and Klipfel Valves.

For *DRAVO CORP.—ARTHUR W. GULLIVER* has joined the New York office staff as application engineer to handle the sale of fabricated piping.

The company also has announced the opening of a west coast office in the Monadnock Bldg., 681 Market St., San Francisco. The office will be under the management of *WILLIAM A. WALTON. FRANK S. TRUMBOWER* will be territorial sales and service manager.

For *C. A. DUNHAM CO.*—New plant manager at the company's Michigan City, Ind. plant is *RICHARD E. SWENEY*. Prior to joining Dunham, Mr. Sweney had been with Pullman Standard Car Mfg. Co. as quality control manager.

For *CARRIER CORP.—GORDON V. BOND*, senior sales engineer in New York, has been named branch man-

FRESH AIR...ANYWHERE
HOSPITALS
SCHOOLS
PUBLIC, CIVIC BUILDINGS
KITCHENS & LAUNDRIES
FOOD PROCESSING PLANTS
WITH MUCKLE VENTS

ANY AIR...ANYWHERE...foul or moist, stale or dry, smoky or gaseous..it's up and out quickly with a Muckle Vent. Proven performance of Muckle Vents guarantees superior efficiency on any building, under any conditions. Architects and builders who compare specify reliable Muckle Vents. For greater working efficiency or controlled customer comfort..you can depend on Muckle Vents. Streamlined, propeller driven, roof mounted..motor out of air stream..15 sizes - 254 CFM to 10280 CFM. Write today for FREE Application information

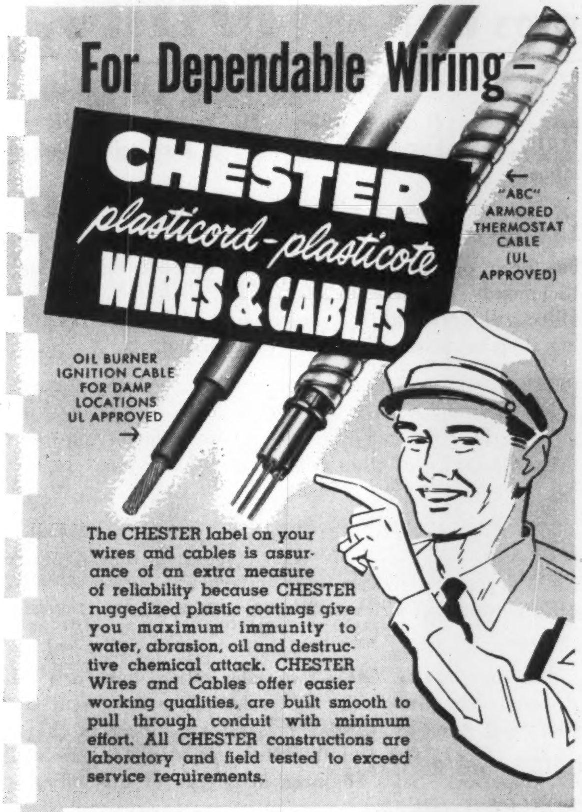
Muckle

MOISTURE IS NO PROBLEM
Remove moisture filled air with maximum efficiency.

MANUFACTURING COMPANY
OWATONNA 8, MINN.

For Dependable Wiring—

CHESTER
plasticord-plasticote
WIRES & CABLES


← "ABC" ARMORED THERMOSTAT CABLE (UL APPROVED)
OIL BURNER IGNITION CABLE FOR DAMP LOCATIONS UL APPROVED →

The CHESTER label on your wires and cables is assurance of an extra measure of reliability because CHESTER ruggedized plastic coatings give you maximum immunity to water, abrasion, oil and destructive chemical attack. CHESTER Wires and Cables offer easier working qualities, are built smooth to pull through conduit with minimum effort. All CHESTER constructions are laboratory and field tested to exceed service requirements.

STANDARD OIL BURNER IGNITION CABLE

FLEXIBLE STEEL CONDUIT

PLASTICOTE THERMOSTAT CABLE

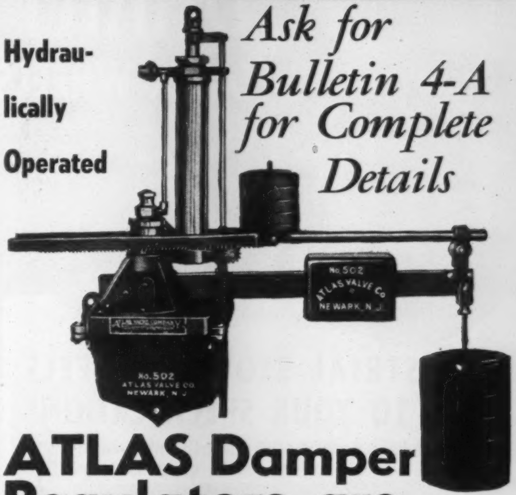
TW BUILDING WIRES

INSTRUMENT WIRE

"Chesty" says — For Dependable Wiring, Connect It with Chester!

CHESTER CABLE CORP.
CHESTER, NEW YORK

ATLAS


No. 502 ATLAS VALVE Co NEWARK, N.J.
No. 502 ATLAS VALVE CO. NEWARK, N.J.

Hydraulically Operated

Ask for Bulletin 4-A for Complete Details

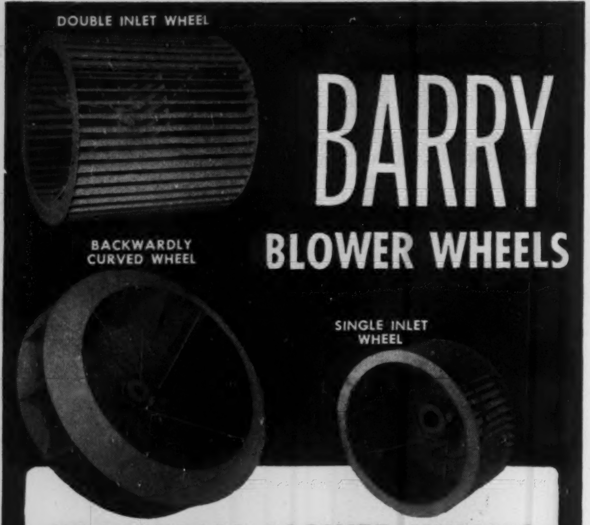
ATLAS Damper Regulators are made for all boiler room conditions. They do this:

1—Continuously maintain the desired pressure in steam boilers by automatically adjusting the boiler drafts or dampers.
2—On forced draft boilers they may be arranged to control the speed of the fan.
3—They may be made to regulate the rate of feed of stokers on stoker fired boilers.
4—By regulating the draft they reduce the amount of air used to the desired minimum.
5—With air volume minimized a higher and more efficient temperature is attained and maintained.
6—CO_2 is kept where it should be and CO is avoided.
7—Much fuel is saved by reducing the volume of air used, eliminating CO, and keeping the chimney gas temperature down where it belongs.
8—They save labor. Without an ATLAS it is necessary to regulate boilers "by hand". Hand regulation costs much more, and, even when watched *constantly* gives a lower boiler efficiency than ATLAS control.
9—ATLAS damper regulators quickly pay for themselves. Installed on almost any boiler they are an important economy factor.

Other ATLAS products: CAMPBELL Boiler Feed Regulators; Temperature Regulators; Reducing Valves; Exhaust Control Systems; Pressure Regulators; Pump Governors; Back Pressure Valves; Balanced Valves; Control Valves; Float Valves; Etc.

ATLAS VALVE COMPANY
REGULATING VALVES FOR EVERY SERVICE

276 South St. **Newark 5, N. J.**
Represented in Principal Cities



INDUSTRIAL BLOWER WHEELS BUILT TO YOUR SPECIFICATIONS

Barry blower wheels assure smooth long lasting service. Each wheel precisely built, expertly trued and perfectly balanced by a company manufacturing blower wheels exclusively. Prompt delivery on any type heavy duty industrial blower wheel from 6" to 72" diameter. Send your specifications and we shall be pleased to quote immediately. Barry Blower Co., 3100 California St., N.E., Minneapolis 18, Minnesota.

WHO'S WHAT

Continued

ager of the Houston office. He replaces *OSCAR H. MEHL*, who has been transferred to the Dallas district office.

For *BUENSOD-STACEY, INC.*—A new branch office has been opened at 601 Central National Bank Bldg., Richmond, Va. Headed by *R. D. MELTON*, the new office will work with the construction staff of the fabricating shop established last fall in Richmond.

For *READING TUBE CORP.*—A new distribution depot has been opened in Cleveland to provide improved delivery service to Ohio and parts of Michigan.

For *LIQUIDEPTH INDICATORS, INC.*—*FREDERICK S. BARTLETT* has been appointed representative for Maryland, Delaware and eastern Pennsylvania. His offices are at 55 Cricket Ave., Ardmore, Pa.

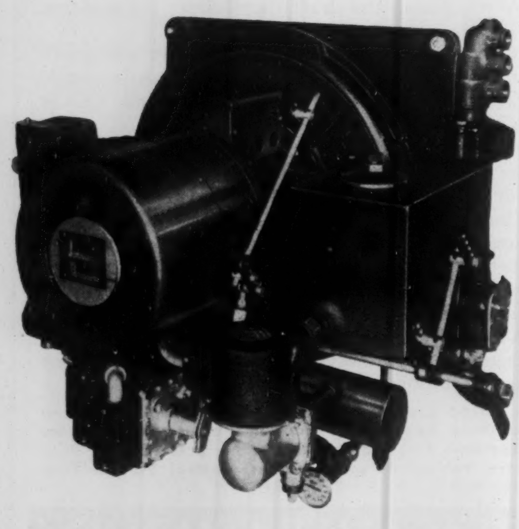
For the *TRANE CO.*—Two sales offices have new addresses. The Greenville, S.C. sales office is now at 214 McDaniel Ave. *R. G. BECK* is sales engineer in charge of the office. The Duluth, Minn. office now is at 2830 W. Superior. Sales engineer in charge of this office is *ROBERT T. DEAN*.

"Cold Starts" with Heavy Oils are Faster, Smoother, Surer with the new JOHNSON "Fifty-three" Metering Pump Burner

Built with a positive-displacement Metering Pump . . . a hydraulically balanced 3-Way Magnetic Oil Valve . . . and a high-efficiency Suction Pump, this new Johnson Burner will start up and operate automatically on colder oils than any other burner on the market today.

Never before has any heavy-duty burner so completely overcome the problem of Variable Temperatures and Viscosities. The Johnson "Fifty Three" makes it possible for the first time, to maintain a fixed Air-Fuel-Ratio regardless of temperature and viscosity changes.

The "Fifty Three" is built in 7 sizes, from 25HP to 400HP capacities . . . and all characterized by the high efficiency and fuel economy for which Johnson Burners have long been famous. All working parts are easily accessible for inspection, servicing or regulation. If you have a heavy-duty heating problem, make it a point to investigate the performance of this great new burner. We will gladly send you detailed information.



Johnson Oil Burners

S. T. JOHNSON CO.
940 Arlington Ave., Oakland 8, Calif.
Church Road, Bridgeport, Pennsylvania

Builders of fine Oil Burner Equipment since 1903

Control your air

individually adjustable

2 way and 4 way air deflection

Designed for installation where quality and performance are of prime importance. They may be found in America's newest and finest schools, hospitals, and industrial plants. They have been installed recently in the new plant of Davis & Geck, Inc., manufacturers of sutures and surgical specialties, Danbury, Conn. (shown below).

Architect — Leo Caproni, New Haven, Conn.; Consulting Engineer (Heating and Ventilating) — Paul D. Harrigan, Hill & Harrigan, New Haven, Conn.; Contractor — G. R. Cummings Company, Meriden, Conn.

FREE Catalog on Request

Specify and Install R & G REGISTERS and GRILLES

SOLID, STRONG BARS

1. Constructed of sturdy 14 gauge steel bars.
2. Fixed bars, single or double deflection.
3. Interlocking Cross Bars for Added Strength.
4. Finished in various types of electro-plating.
5. Bars adjustable only with special tool provided.
6. Tamperproof and Kickproof — Built to withstand abuse.

R G

Complete Line of Registers and Grilles for
HEATING • VENTILATING • AIR CONDITIONING

REGISTER & GRILLE MFG. CO., INC.
70 BERRY STREET, BROOKLYN 11, N. Y.

- **Highest Thermal Efficiency**
- **Minimum Pressure Loss**
- **Positive Oil Return with Vapor**
- **Most Efficient Heat Transfer**
- **Assures Turbulent Fluid Flow**

Yula FREON COOLERS

For use in Air Conditioning, Refrigeration, Industrial and Process Cooling, using water and other fluids. Refrigerant passes through Tube Side and is vaporized. Fluid being cooled passes thru Shell Side which is baffled.

Investigate Yula before you order

Other Yula Products

- Converters
- Instantaneous Heaters
- Condensate Coolers
- Yula-trol Fuel Oil Detector & YT Heater
- Mixing Valves
- Other Types of Fuel Oil Heaters
- All Types of Special Heat Exchangers

Dry Expansion Type

Ask for Catalog FC-10

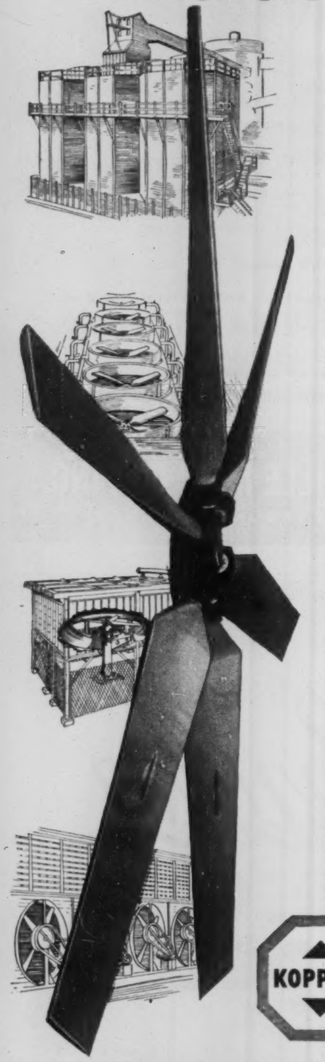
A.S.M.E. CONSTRUCTION

YULA WATER HEATERS, INC.

166 WEST 225th STREET, NEW YORK 63, N.Y.

Here's Why Aeromaster Fans

mean more satisfactory cooling equipment operation



Manufacturers and users of cooling equipment agree . . . Aeromaster Fans give outstanding service. Here are the reasons why.

Aeromaster Fans are *precision-engineered,* adapted from high speed aircraft propellers. They have adjustable blade pitch and anti-flutter design . . . therefore, require less horsepower. And they last longer too, thanks to the exclusive Aeroloid blade coating to resist acids and alkalies, abrasion and weather. Overall result: Aeromaster Fans *give more cooling at lower cost.*

Available in 4, 6, or 8 blade styles, in diameters of 5 to 24 ft., with capacities up to 1,000,000 cubic feet per minute, all Aeromaster Fans are fully guaranteed.

Koppers also has trained engineering specialists available in principal cities, insuring prompt, expert Aeromaster Fan service. And Koppers is always ready to consult with you on special fan problems. Next time you plan a replacement of present fans, specify Aeromaster. And when you consider new equipment, call on Koppers . . . always eager to be of service.

KOPPERS

Aeromaster Fans

METAL PRODUCTS DIV. • KOPPERS COMPANY, INC. • BALTIMORE, MD. • This Koppers Division also supplies industry with Fast's Couplings, American Hammered Industrial Piston and Sealing Rings, Koppers Electrostatic Precipitators, Gas Apparatus. ***Engineered* Products Sold with *Service***

MAIL COUPON TODAY FOR COMPLETE INFORMATION

KOPPERS COMPANY, INC., *Aeromaster Fans,* 245 Scott St., Baltimore 3, Md.

Gentlemen: Please send me detailed information on Aeromaster Fans for

....

(name and type of equipment to be cooled)

Name..

Title........................Company.............................

Address...

City........................Zone......State........................

NEW BOOKS & REPORTS . . .

Handbook on Gas Regulation

The engineering department of the Rockwell Mfg. Co. has published a complete text on the theory of gas regulation and on the installation and maintenance of gas regulators.

The *Gas Regulator Handbook* contains more than 120 drawings and photographs and is recommended by the company as a practical textbook for gas courses taught at the college level.

The 11 chapters in the book cover the following subjects: fundamental principles of regulators; selection of type and size of regulators; regulator specifications and dimensions; operation of various types of regulators; installation procedures; maintenance procedures; regulator repair; regulator capacity tables; special applications and procedures; how to order regulators; and miscellaneous tables, specifications and data listings pertinent to the gas regulator field.

The 12 page chapter on miscellaneous information contains several tables showing pressure and temperature factors, weight, area and pressure equivalents, etc.

Although only the manufacturer's regulators are specifically described, the book is devoted primarily to problems common to the entire field, methods of overcoming these problems and other general information.

Bound in a multiple ring binding, the handbook is available from the Rockwell Mfg. Co., 400 N. Lexington Ave., Pittsburgh 8, Pa., for $2.50.

G&O COILS for HEATING and COOLING

G&O RADIATION

A full line of sizes now available to meet all industrial requirements. Send for catalog.

THE G&O MANUFACTURING COMPANY
New Haven 8, Connecticut
Pioneer Manufacturers of Square Finned Tubing in the United States

You Buy
DEPENDABILITY
When You Buy
CARVER

Model B ELECTROPUMPS
Capacities up to 70 G.P.M.
Heads up to 110 Feet.
1" and 1¼" Discharge

Don't take a chance on being shut down for service calls when the weather man says "Hot and Uncomfortable Today."

Specify CARVER AIR CONDITIONING ELECTROPUMPS . . . make sure you get thoroughly dependable pumping at all times . . . keep your air conditioning system at top efficiency every day of the year.

With CARVER you have the greatest little pump in the industry. Soundly engineered, it's a combination of pump and motor that leads the field in quality, performance and appearance.

CARVER *has the answer to your pumping problems.* Capacities up to 4200 G.P.M. Pressures up to 135 pounds. Give us the conditions we'll give you the answer.

Ask for Bulletin No. 211

CARVER PUMP COMPANY **1460 Hershey Avenue**
MUSCATINE, IOWA

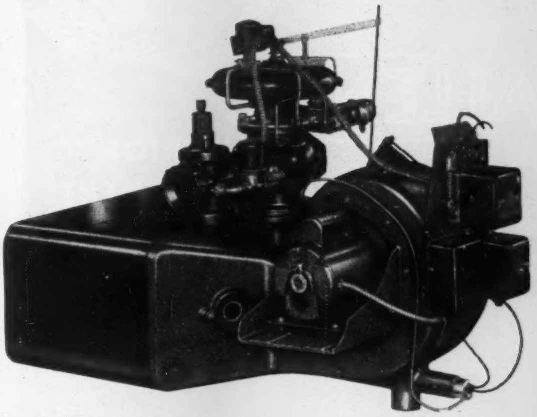
CARVER
The Quality Name in Pumps

CARVER
PUMPS

A distinguished Pair of

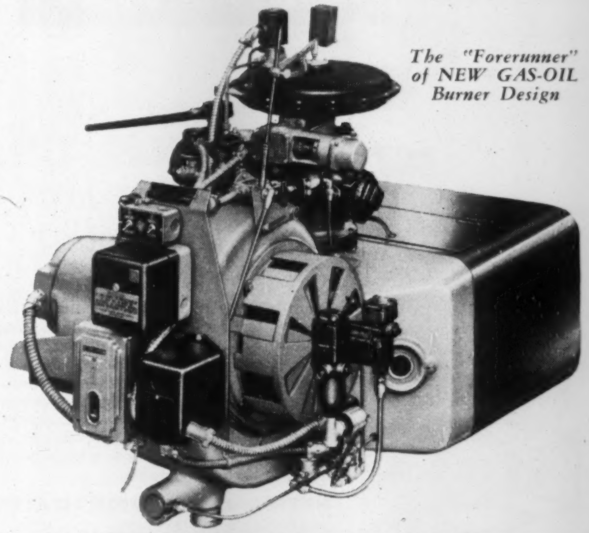
AUTOMATIC
MECHANICAL DRAFT
"PACKAGED"

GAS or OIL BURNERS



Model 32F-3 - Gas Burner - 250 H.P.

New 1954 Model features automatic safety pilot and triple controls. Not just a burner, but a COMPLETE and FULLY AUTOMATIC GAS BURNER SYSTEM, factory tested and ready for application when received. Furnished complete as pictured, with simple dependable automatic "On and Off" or modulating controls. Burner and controls WITH SPARK IGNITION and FLAME SAFEGUARDS are scientifically coordinated to provide INSTANT FUEL SHUT-OFF on FLAME FAILURE—MEETING APPROVAL REQUIREMENTS. 12 sizes, 5 to 500 H.P.



The "Forerunner" of NEW GAS-OIL Burner Design

Model MGO-5D4 - Gas or Oil - 250 H.P.

A fully automatic mechanical draft burner employing the ENTRAINED COMBUSTION PRINCIPLE operates equally efficiently with any gas or No. 2 to No. 5 Fuel Oil. A "**flip of the switch**" or automatic remote control changes from Gas to Oil or in reverse. Nothing else like it on the market. Another example of Mettler Leadership designed to fill the trend and need of the Gas Industry for peak-load emergencies.

ALL BUILT ON THE
"Entrained Combustion"
PRINCIPLE

The METTLER CO. INC.
4366 WORTH ST. **LOS ANGELES 63, CALIF.**

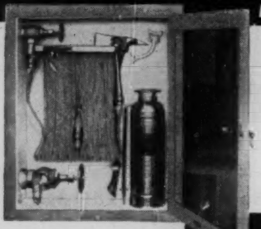
Best for Clients

PROVED RELIABLE,
ECONOMICAL

ALLENCO

INTERIOR
FIRE-PROTECTION EQUIPMENT

Complete Line — 480 Cabinets Alone
Modern, Most Widely Used



Easiest for you

Reliable Delivery—
Goes in Easier

SINCE 1887

W. D. ALLEN
Manufacturing Co.
CHICAGO 6 · NEW YORK 7

NEW BOOKS & REPORTS

Continued

Cast Iron Drainage Fittings

Cast Iron Screwed Drainage Fittings, published by the American Standards Association, gives 16 pages of information, including diagrams.

This new American Standard specifies size, marking, material and tolerance of fittings. Specifications are given for shoulders on the fittings. Also included is information on ribs, threading and coating of fittings.

The book is available for $1.00 from the American Standards Association, 70 E. 45th St., New York 17.

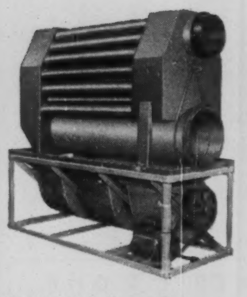
Electrical Analogue for Refrigeration

Extending the resistance method of studying heat transfer problems one step further, Carl F. Kayan, Dept. of Mechanical Engineering, Columbia University, has applied the electrical analogy method to predict the overall performance of a refrigerating system. Conventional methods of computing this value have not been too successful in the past, because of the many simultaneous variables in force at any given time.

In a paper entitled *Refrigeration Plant Performance Characteristics by Electrical Analogue Analysis*, prepared for presentation at the international meeting of the American Society of Mechanical Engineers in Mexico City, March 10-12, Professor Kayan outlines the results of his research on this project.

The paper explains how the temperature and energy relationships of the component parts were developed in terms of known electrical resistances. These ohmic values

the "heart" of
NATIONAL CHAMPIONS
wring more heat from
your fuel dollar



Stainless steel, teardrop design firebox unit—the "heart" of National Champions.

Year after year National Champion direct fired heaters wring more heat from fuel dollars. How? Chiefly with the stainless steel "heart" in all National Champions.
Easy to wipe teardrop design allows a constant, uniform flow of clean air over the heating unit. Designed for light oil, heavy oil, gas or gas-oil firing, National Champions are completely automatic to maintain 80% efficiency. Easy to service—no refractory materials or combustion chamber maintenance. Welded into a long-lasting, one-piece unit with straight economizer tubes.

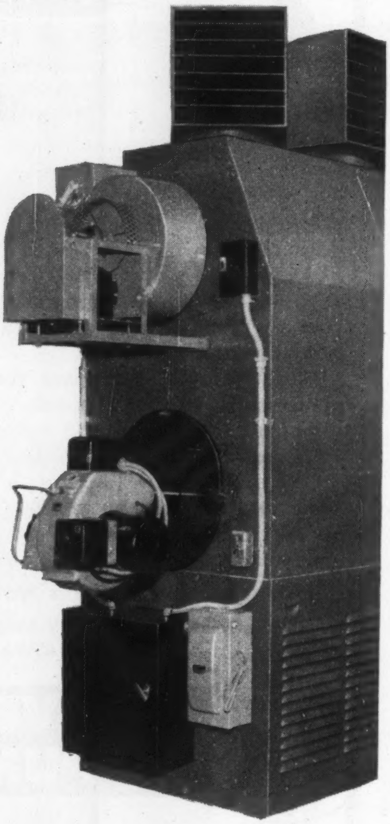
NATIONAL CHAMPION HEATERS
200,000 to 2,000,000 BTU
For large space heating, make-up air, drying, curing and de-icing.

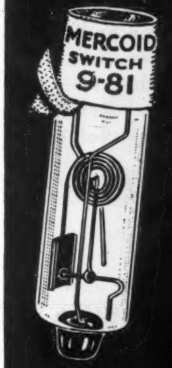
Model H—vertical unit with discharge heads. 12 sizes.
Model D—vertical unit for duct work. 12 sizes.
Model P—portable, vertical unit for flexible duty. 6 sizes.
Model R—inverted unit with discharge heads at bottom. 12 sizes.
Model S—vertical unit with side blowers to permit location of air mixing dampers. 12 sizes.
Model C—horizontal ceiling suspension unit for space saving. 12 sizes.

Completely wired, assembled and carefully fire tested to assure peak performance after installation. Listed by Underwriters' Laboratories, Inc.

Write today for complete information and specifications.

NATIONAL HEATER COMPANY, INC.
2182 Cleora Avenue, St. Paul 4, Minnesota.





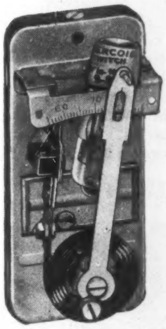
THE MAGNETIC MERCURY SWITCH

AN EXCLUSIVE FEATURE OF THE

MERCOID® SENSATHERM®

This magnetic mercury switch is backed by over thirty years of intensive engineering research. It is manufactured by the leading manufacturer of sealed mercury contacts.

NO SPECIAL ADJUSTMENTS ARE REQUIRED IN THE SENSATHERM



The magnetic mercury switch plus other engineered components *ELIMINATES INTERNAL HEATER COILS.*

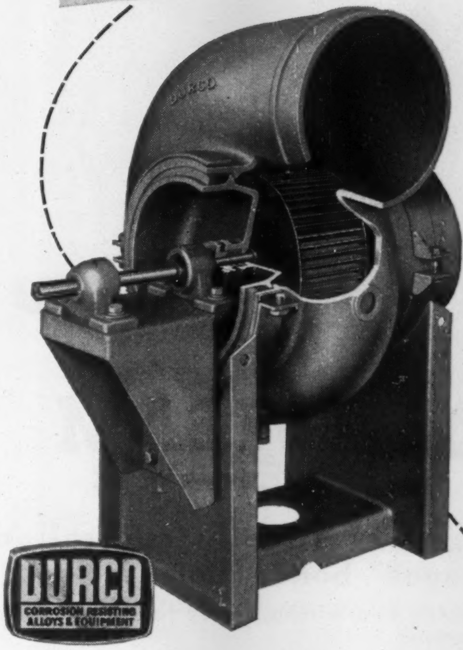
No need to refer to charts for cycle adjustments, differential adjustments or settings for long or short operations. The Sensatherm is factory set for a minimum sensitivity of ½°F. (plus or minus). Furthermore, all essential parts of the Sensatherm are hermetically sealed and cannot change their inherent characteristics, therefore remaining constant and assuring years of even room temperature control.

Mercoid Sensatherms are available for heating, cooling, air conditioning and refrigeration applications.

Write for Catalog 700B

THE MERCOID CORPORATION
4201 BELMONT AVE., CHICAGO 41, ILLINOIS, U.S.A.

new — all metal — completely corrosion-proof



exhaust fans

No thin-skin corrosion resistance here! These newly designed DURCO exhaust fans are *acid-proof metal*—Duriron casing with Durimet 20 multi-blade rotor for permanent acid resistance throughout.

The new lighter DURCO fans are designed to handle acid fumes in schools, laboratories, hospitals and industrial plants efficiently, economically—and *permanently*.

THE DURIRON COMPANY, Inc.
Dept. HP, Dayton, Ohio

Please send Bulletin F/1 on DURCO B-124 Fans.

Name ____________________
Company ____________________
Address ____________________
City ____________ State ____________

NEW BOOKS & REPORTS

Continued

were then coupled into an electrical circuit in which total current from the compressor and evaporator branches in parallel equals that flowing in the condenser circuit. Using adjustable resistances enabled the author to set up various composite systems and predict the overall performance of a specific hook-up with elements of known characteristics.

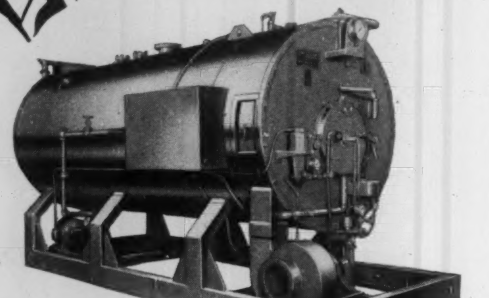
Headquarters of the ASME are at 29 W. 39th St., New York 18.

Field Tests of Coatings for a Pipe Line

Field Tests of Exterior Coatings for a Pipe Line Conveying Fuel Oil Heated to 200 Degrees F describes field experiments made to determine a suitable exterior protective coating for an oil transmission pipe line between the refinery and a steam-electric generating station. The paper was presented by E. R. Stauffacher and R. R. Davidson at the ninth annual conference of the National Association of Corrosion Engineers.

To test stability, four different coatings were applied to 20 ft lengths of 8 in. pipes connected in series and buried in the soil. Oil heated to 200 F was circulated through the pipe for approximately two weeks. Provision was made to apply an external pressure of 10, 50 and 80 psi. After the experimental hot oil circulation was completed, the ditch was opened and the coatings examined for distortion and adherence and electrical resistance measurements were made at the depression points.

No Annoying "Extras"
IT'S READY TO INSTALL
AND START MAKING
Low-Cost Steam!



20 SIZES...
10 to 600 h.p...
15 to 200# OIL OR GAS

AMESTEAM GENERATOR

This automatically controlled packaged boiler unit includes:

★ all piping and wiring, ready for your service connections.

★ fan, feed water pump, condensate tank, injector, blow-off valve, necessary refractories, insulation and metal jacket.

ALL YOU NEED is fuel tank, gas vent and service connections.

—AND YOU KEEP RIGHT ON SAVING with these trouble-free, fully automatic units with their eye-level controls, their accessibility inside and out, and fuel-saving 80% guaranteed efficiency!

FOR FACTS ON LOWER COST STEAM
WRITE FOR THIS FREE BULLETIN NOW!

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COMPANY....................................
ADDRESS....................................
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AMES IRON WORKS

BOX D-54 OSWEGO, N. Y.

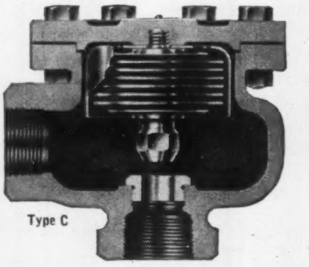
Builders of Better Boilers Since 1848

Nicholson Steam Traps Test

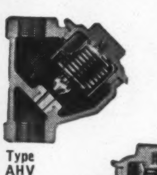
MAXIMUM CAPACITY PER $ COST

One of the nation's largest plants recently conducted comparative tests of steam traps. They showed that Nicholson traps "provide lowest initial cost for handling large amounts of condensate." Other Nicholson features: operate on lowest temperature differential; only one moving part; freeze-proof. See why leading plants are increasingly standardizing on Nicholsons for faster heat transfer. 5 types: size ¼" to 2"; pressure to 250 lbs.

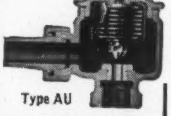
BULLETIN 853



Type C



Type AHV



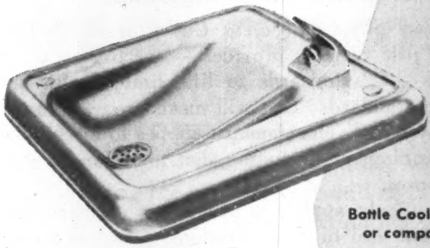
Type AU

198 Oregon St., Wilkes-Barre, Pa.

W. H. NICHOLSON & CO.

TRAPS · VALVES · FLOATS

Temprite



WITH THE

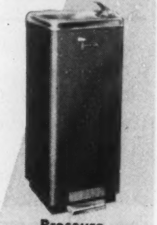
DEEP

STAINLESS STEEL

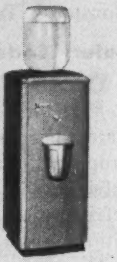
TOP

EVERYTHING about the beautiful Temprite Water Cooler is generous, substantial, sturdy! The sanitary stainless steel top is *extra deep* . . . the anti-splash guard *extra full* . . . The flow of cool water won't splash, won't spurt, won't find its way on to the surrounding floor!

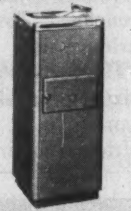
Dismantle the Temprite, if you wish; look inside and you will see the fully corrosion resistant cooling system, the *extra strong* all-welded steel frame, and *heavy gauge* sheet steel cabinet panels. Built for years of service. The compressor is hermetically sealed and lubricated for life. Everything about the Temprite line spells *EXTRA* QUALITY!



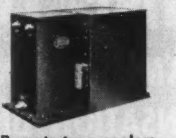
Pressure Bubbler Coolers in Nine Models.



Bottle Coolers in standard or compartment type.



Bubbler type compartment coolers



Remote type coolers in three sizes.

Temprite accessories include wall fountains, glass fillers, transformers, optional push-button control assembly, etc.

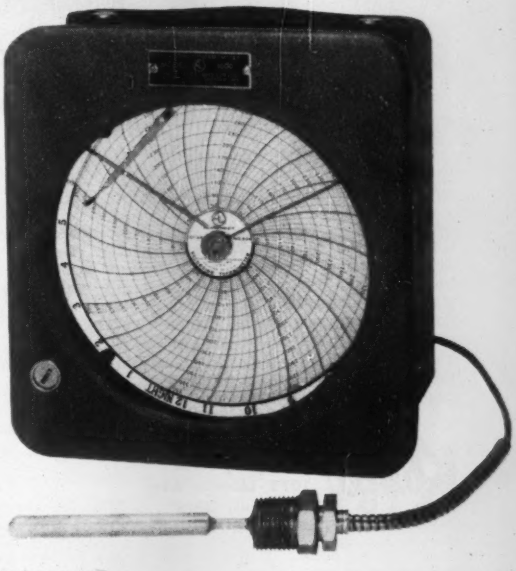
Since 1929

Temprite
PRODUCTS CORPORATION

P.O. BOX 72-L
EAST MAPLE RD.
BIRMINGHAM
MICH.

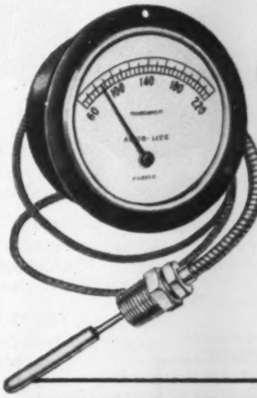
For Eye-Level Readings...

AUTO-LITE



Model 1000
TEMPERATURE RECORDER

This newly designed recorder has evenly calibrated, 6-inch chart... attractive die-cast case. Various standard ranges from minus 40°F to plus 550°F. Illustrated above is wall mounting type, with capillary tubing for remote reading. Also available with portable case with capillary and portable self contained. Obtainable with a cycle indicator for refrigeration.



Model G
TEMPERATURE INDICATOR...

Wide selection of dial ranges. Various mountings to meet your needs. Send for new catalog of Auto-Lite Recording and Indicating Thermometers.

THE ELECTRIC AUTO-LITE COMPANY
INSTRUMENT AND GAUGE DIVISION
TOLEDO 1, OHIO
NEW YORK • CHICAGO • SARNIA, ONTARIO

Tune in "SUSPENSE!"...CBS Radio Mondays... CBS Television Tuesdays

for more
accurate
pressure
control
the NEW
Klipfel
PILOT-OPERATED
REDUCING VALVE
No. 933

QUICK ACTING FOR MINIMUM PRESSURE VARIATION

When you need "on-the-button" steam pressure reduction, specify the new Klipfel Pilot-Operated Reducing Valve. Although extremely sensitive, its simple operation insures trouble-free service. Downstream pressure is sensed by the diaphragm of the pilot valve. The pilot valve uses upstream pressure to open the main valve if downstream pressure is too low; if too high, pressure is bled off to partially close main valve.

The next time you order a reducing valve, get the new standard for accurate control and low cost operation . . . Klipfel No. 933 Reducing Valve. Detailed literature on request.

Klipfel VALVES, INC.
1075 Lincoln Ave.
Hamilton, Ohio

NEW BOOKS & REPORTS

Continued

Additional 40 ft pipe lengths with each of the four different coatings then were subjected to cold bending to a total angle of approximately 20 deg. After each bend, the coatings were examined for cracks.

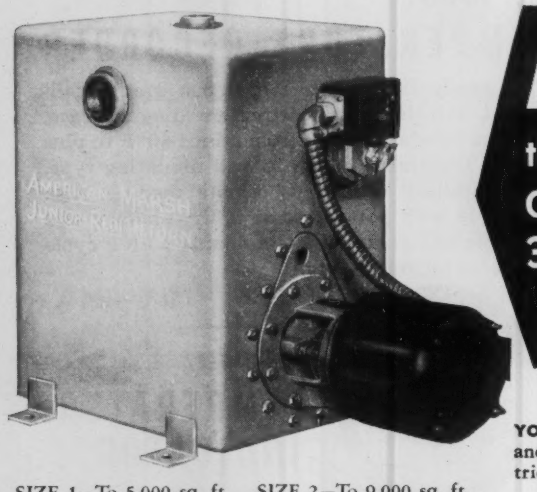
As a result of the test, it was decided to recommend a ½ in. thick asphalt mastic coating using a 250 F melting point asphalt for the exterior coating of this hot oil pipe line. The paper was published in the October 1953 issue of Corrosion, Journal of National Association of Corrosion Engineers, 1061 M & M Bldg., No. 1 Main St., Houston 2, Texas.

Safety Code for Mechanical Refrigeration

The *American Standard Safety Code for Mechanical Refrigeration*, just revised, provides — according to its stated purpose — "safeguards to life, limb, health and property," and standards "that will mean progress for all refrigerating systems." The standard applies to mechanical refrigeration equipment, including that used for air conditioning purposes.

The code not only applies to residences of more than two families, but also to all institutions, places of public assembly, commercial and industrial buildings and mixed occupancies, or buildings used for different purposes in various parts.

The revised code makes provisions for improvements in refrigeration since 1950, when the previous edition was approved. It clarifies the requirements for mechanical refrigeration in all buildings, but does not apply to re-



SIZE 1—To 5,000 sq. ft. radiation at 20 lbs. discharge pressure—18,000 sq. ft. at 8 lbs. pressure.

SIZE 2—To 9,000 sq. ft. radiation at 30 lbs. discharge pressure—18,000 sq. ft. at 20 lbs. pressure.

A LINE YOU'LL LIKE...

these AMERICAN-MARSH Junior Redi-Return CONDENSATION UNITS offer you 3 DISTINCT ADVANTAGES

1. They save floor space.
2. No misalignment troubles.
3. Top quality at competitive prices.

YOU'LL LIKE INSTALLING Junior Redi-Return Units. They take little floor space and need no special foundation. Just bolt down, connect two pipes and electrical lead. That's all! Installation is speedy and profitable.

YOU'LL LIKE THE DESIGN that eliminates shaft alignment troubles. It also makes inspection simple and quick, and assures quiet, dependable operation of impeller submerged in condensate, even at temperatures to 210°F. Working parts removable without touching pipe connections.

YOU'LL LIKE QUALITY, PRICE advantages. Top-quality features include: Bronze-fitted pump . . . balanced, enclosed bronze impeller . . . lifetime lubrication . . . heavy, 16 gal. copper-bearing steel tank . . . drip-proof ball-bearing motor . . . heavy-duty float switch. Yet Junior Redi-Return Units are competitively priced — ideal for hotel, store, school, office and apartment heating systems.

Get performance and specification data—
WRITE FOR JR. REDI-RETURN BULLETIN 425.

Pumps and Pumps only Since 1873

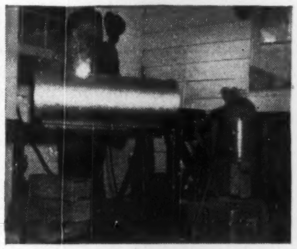
AMERICAN-MARSH PUMPS

BATTLE CREEK MICHIGAN

In Canada:
American-Marsh Pumps (Canada) Ltd., Stratford, Ont.

CENTRIFUGAL, TURBINE, STEAM AND POWER PUMPS FOR TESTING, PROCESSING, BOILER FEED, FIRE PROTECTION, ETC.

WELDING 12″ PIPE *using 5/32″ "Fleetweld" electrodes with five passes. "Lincwelder" power cuts welding time . . . reduces costs.*



FABRICATING *36″ section of 12 gauge galvanized pipe with "Lincwelder". Joint is butt welded, made with 1/8″ "Fleetweld" rods.*

WANT TO REALLY CUT COSTS?

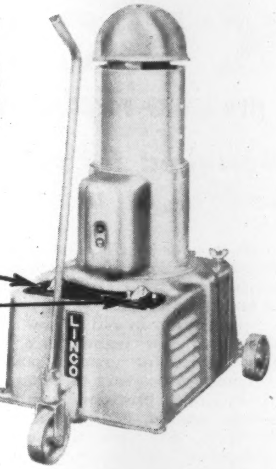
Here's How: *Speed your welding . . .* eliminate burn through . . . cut cleaning time. You can do all these by using *the right type arc* and *right arc* intensity with "Lincwelder's" Dual Continuous Control.

Result . . . less manhours for quality welding . . . to bring costs down.

START A COST REDUCTION PROGRAM NOW. Only Lincoln has the famous Dual Continuous Control. So have a Lincoln representative show you where and how you can simplify and save money on sheet metal jobs.

LINCWELDER DC-250-MK

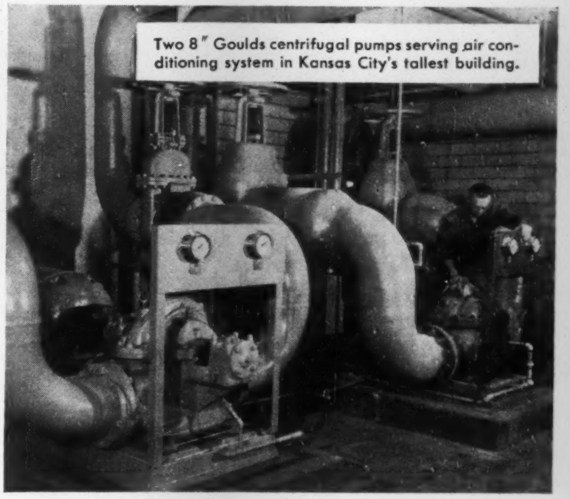
SUIT ARC TO JOB



"LINCWELDER" . . . low priced Lincoln DC motor driven welder. Preferred for speed and ease of welding for all types of sheet metal work. Costs less than other welders of similar type and capacity.

THE LINCOLN ELECTRIC COMPANY
Dept. 3802 • Cleveland 17, Ohio

LOOK TO LINCOLN FOR LEADERSHIP
The World's Largest Manufacturer of Arc Welding Equipment



Two 8″ Goulds centrifugal pumps serving air conditioning system in Kansas City's tallest building.

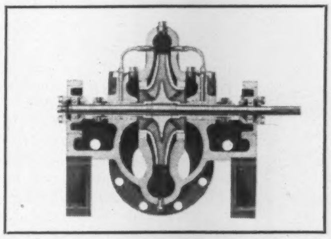
These pumps help 800 Kansas Citians enjoy summer work

The 33-story Kansas City Power & Light Co. Building—tallest in this Midwest metropolis—has a new air conditioning system. That means cool comfort for more than 800 office workers.

The job of circulating the water used in the system requires rugged, dependable pumps that will deliver full capacities and pressures year after year, with low power requirements and low maintenance cost.

Four Goulds centrifugal pumps do the job. They're set up in two pairs—for flexible and economical operation under varying demands. The larger pair, for carrying peak loads, consists of an 8″ Fig. 3075 which pumps condenser water, and an 8″ Fig. 3405 which circulates cooled water. Each pump handles 2550 GPM.

The smaller pair, both 3″ Fig. 3405 pumps handling 450 GPM, takes over the water-circulating job on week-ends and other times when the cooling requirements are low.



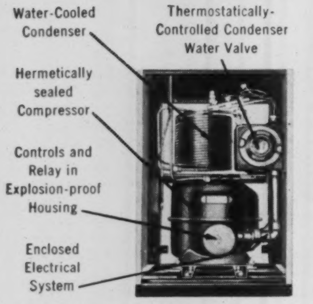
Cross section of Goulds Fig. 3405 pump, showing double-suction construction. Casing is horizontally split, and pump may be dismantled and repaired without disturbing piping. Bulletin 721.6 describes this pump in detail. Write for a copy.

There are Goulds pumps for every air conditioning application, with capacities to 15,000 GPM; heads to 500 ft. Goulds engineers will be glad to consult with you on any pumping problem. Write, wire or phone Goulds Pumps, Inc., Seneca Falls, N. Y.

Goulds PUMPS INC.
Seneca Falls
New York

EXPAND YOUR SALES WITH . . .

Explosion Proof!
TEMPRITE
WATER COOLERS
FOR...
Grain Processing Plants
Textile Mills
Wood Working Plants
Hospital-Surgical Rooms
FOR...
Chemical Plants
Refineries
Paint Plants
Collieries
The Cooler with the DEEP Stainless Top!


Water-Cooled Condenser
Thermostatically-Controlled Condenser Water Valve
Hermetically sealed Compressor
Controls and Relay in Explosion-proof Housing
Enclosed Electrical System

Temprite explosion-proof water coolers are *essential* in a long list of potentially combustible factory atmospheres. Invariably these dangerous atmospheres also contribute to thirst with coal dust, grain dust or wood dust floating in suspension. Underwriters' approved for Class I, groups C and D; Class II, groups F and G; and Class III of the NEMA Code. Write now for details.

Temprite Products Corporation
P. O. Box 72-L, East Maple Rd., Birmingham, Michigan
Send me distributor franchise information, I am interested in handling Temprite Water Coolers.

Name____________________
Address____________________
City__________ State__________

NEW BOOKS & REPORTS . . .

Continued

frigerating systems in motor vehicles, trailers, on shipboard or trains.

The sections on piping and pressure vessels have been completely revised for maximum safety because of newly acquired knowledge in the field. Specifications for pressure relief devices have been expanded in the revision.

The code was developed by representatives of national groups concerned with the manufacture of mechanical refrigeration equipment and refrigerants, government, safety and insurance groups, and representatives of users. The American Society of Refrigerating Engineers furnished administrative leadership as sponsor of the project.

Copies of the code may be obtained from the American Standards Association, 70 E. 45th St., New York 17, for $1.00 a copy.

OTHER BOOKS AND REPORTS . . .

1951 *PROCEEDINGS OF THE NATIONAL DISTRICT HEATING ASSOCIATION* — official proceedings of the 42nd annual meeting of the NDHA held in Detroit, June 1951.

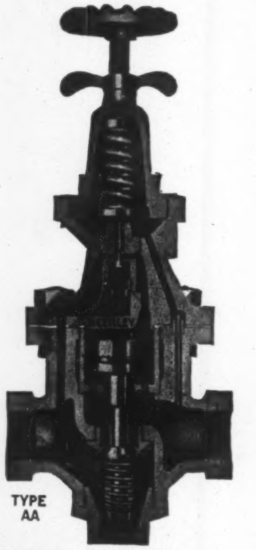
Published by the National District Heating Association, 827 N. Euclid Ave., Pittsburgh 6, Pa., its price is $10.

RADIAL TEMPERATURE GRADIENT ACROSS THE WALLS OF CYLINDRICAL PIPES CONTAINING HEATED FLUIDS — article appearing in the March 1954

KECKLEY

pressure regulators

Designed for better control at less cost


KECKLEY
TYPE AA

When your specifications call for pressure regulators for steam or air service, you want accurate control of reduced pressures which you can depend on, day in and day out. You also want low maintenance, and long service for greatest possible economy. Our years of experience in building precision regulators assure you of getting these advantages. Ask your Keckley representative or your industrial distributor about the correct regulator for your job!

Send for Catalog 54-F with Complete Information on Keckley's Complete Line

- RELIEF VALVES
- FLOAT BOXES
- SOLENOID VALVES
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- PRESSURE REGULATORS
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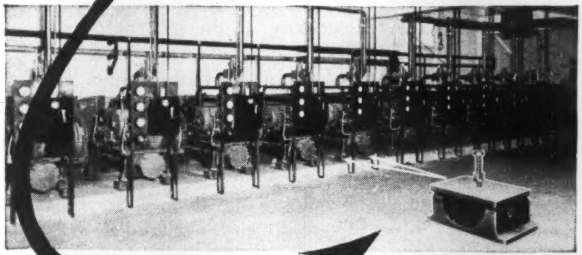
- POP SAFETY VALVES
- STRAINERS

1914 **O. C. KECKLEY CO.** *1954*
400 W. Madison Street • Chicago 6, Illinois
40th Anniversary

STOP VIBRATION



with KORFUND VIBRATION CONTROL

Problem: When erecting a new office building, a prominent refrigeration equipment manufacturer wanted to install 41 of his units in two penthouses. Light-weight flooring with 40 foot spans between columns was planned. Vibration and noise transmission had to be prevented.

Solution: Korfund steel spring Isolators and Elasto-Rib pads completely prevented vibration and noise transmission, eliminated all bolting to the floor, and made economical light-weight floor construction possible.

In Air Conditioning, Korfund Vibration Control has paid off in dollars and cents for thousands of Engineers and Contractors, because Korfund units reduce transmitted vibration and:

- Permit installation *anywhere* in apartment, public, and industrial buildings
- Decrease original building and foundation costs
- Permit installation without reinforcing floors
- Lengthen machine life
- Permit higher operating speeds
- Reduce maintenance costs
- Insure quieter operation

We'll gladly send more information on Korfund Vibration Control for compressors, fans, pumps, boilers, air conditioners and other equipment, write today for your free copy of Bulletin #2, or see our catalog in Sweet's Files.

For specific recommendations, contact us or your local Korfund office. A half century of experience is at your disposal.

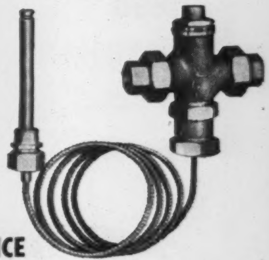
THE KORFUND CO., INC.

KORFUND VIBRATION CONTROL
SPRINGS RUBBER CORK

48-01F Thirty Second Place, Long Island City 1, N. Y.
In Canada: 510 Canal Bank, Ville St. Pierre, Montreal

THE SEARCH ENDS!

when you discover the **Sterlco®**



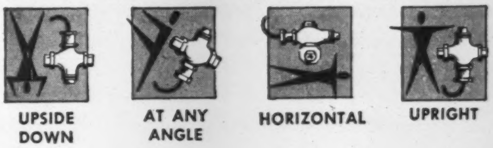
Series 150-E TEMPERATURE CONTROL

it gives you...

ACCURATE CONTROL
DEPENDABLE PERFORMANCE
at a LOW COST

It is a self-actuated, completely automatic modulating control valve — for any heating or cooling application using steam, water, or other heat transfer fluids. Available in sizes and temperature ranges for all operations... and, remember, only the Sterlco Series 150-E

MOUNTS AND OPERATES IN ANY POSITION



Sterlco® THERMOTROL

COLD
NORMAL

Rugged, dependable, automatic, individual radiator temperature control. Easily set to desired temperature—maintains it by modulating the flow of steam or hot water to the radiator in balance with air temperature. Self contained — easily installed without wiring or external connections.

Adaptable to Zone Control in Radiant Heat Systems — ask for details.

STEAM HEATING is MODERN, EFFICIENT and DEPENDABLE

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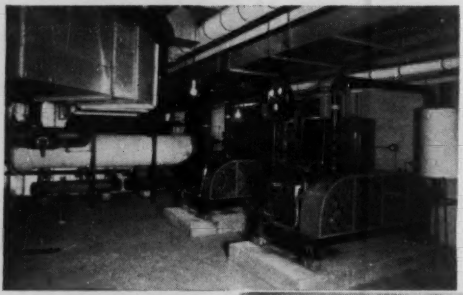
CONDENSATION AND VACUUM PUMPS

HEATING SPECIALTIES

TEMPERATURE CONTROLS



need refrigeration you can rely on?

CHECK with VILTER

One of the most modern hospitals in the Middle West is the United States Army Veterans Hospital at Omaha. Latest medical techniques are employed here, while laboratories in the hospital constantly are conducting research for new and better treatments. An interesting feature of the hospital is its photographic laboratory. A photographic record—sometimes in color—is kept of patients to show their progress from the time they are admitted until they are discharged. Important parts of the building are air conditioned, and Vilter compressors provide the refrigeration.

Among the air conditioned portions are ten operating rooms, six recovery rooms, six allergy rooms, eight X-Ray rooms, central supply rooms, laboratories, drug room, admittance operating room, and the doctors' offices and lounge. Two Vilter VMC Compressors provide a total of 128 tons of refrigeration.

Hospitals need refrigeration they can rely on . . . but so do food plants, meat packers, brewers, cold storage warehouses, and most other refrigeration applications. You see Vilter so many times in these important applications, because architects, engineers, and contractors know that Vilter refrigeration *keeps on running*. And does it with lower operating and upkeep costs in the bargain.

Vilter®

Your nearby Vilter Distributor or Representative will be glad to show you why Vilter is more reliable —economically.

REFRIGERATION and AIR CONDITIONING

THE VILTER MANUFACTURING COMPANY
MILWAUKEE 7, WISCONSIN

Air Conditioning • Ammonia & Freon Compressors • Booster Compressors • Baudelot Coolers • Double Pipe Coolers • Blast Freezers • Evaporative & Shell & Tube Condensers • Pakicers • Pipe Coils • Valves & Fittings

NEW BOOKS & REPORTS

Continued

issue of the Journal of the Institution of Heating and Ventilating Engineers.

It is often necessary to know what the radial temperature difference is for a known rate of loss of heat, or vice versa, under specified conditions. This knowledge makes it possible to compare the insulative effect of different thicknesses and materials of pipe walls and lagging, for known temperatures of the contained fluid. In enables estimation of the temperature of the external surface of a flue pipe conveying hot gases.

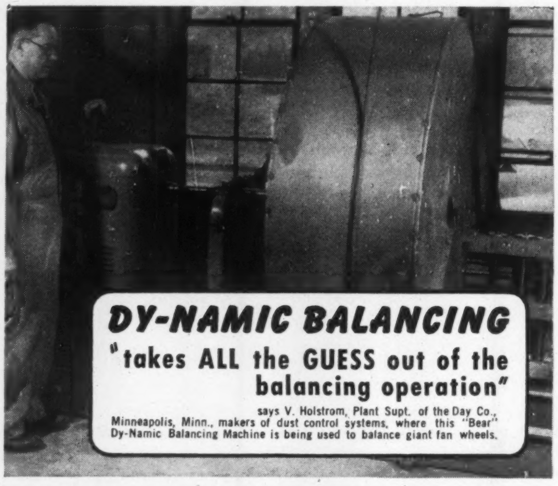
Offices of the Journal are at 49 Cadogan Sq. London, S. W. 1, England.

ELEMENTARY FLUID MECHANICS — third edition of the textbook by John K. Vennard. New material includes an introductory chapter that deals with generalizations on the subject of one dimensional fluid flow. Many new problems have been added to bring the total to 900.

The new edition, published by John Wiley & Sons, Inc., 440 Fourth Ave., New York 16, costs $5.50.

INDUSTRIAL HYGIENE FOUNDATION, Transactions of the 18th Annual Meeting—reports cover the role of government in employer-employee relationships, industrial noise, socio-economic aspects of alcoholism, sick absenteeism, and problems of human relations in industry.

Copies are available at $1.50 from the Industrial Hygiene Foundation of America, Mellon Institute, 4400 Fifth Ave., Pittsburgh 13.



DY-NAMIC BALANCING
"takes ALL the GUESS out of the balancing operation"
says V. Holstrom, Plant Supt. of the Day Co., Minneapolis, Minn., makers of dust control systems, where this "Bear" Dy-Namic Balancing Machine is being used to balance giant fan wheels.

SIMPLIFIED OPERATION of "Bear" Dy-Namic Balancing Machines is so fast, so economical, so easy to learn that manufacturers, maintenance shops and others are employing this revolutionary method with top-production results. No complicated manipulations to learn! Average shop man can learn to balance in a few hours! Get full details by sending for **FREE DY-NAMIC BALANCING MANUAL** . . . tells how you can eliminate noise and vibration, reduce wear and improve performance of rotating parts, *quickly, accurately,* and *economically.* Write: Bear Mfg. Co., Dept. H-16, Rock Island, Ill.

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"BEAR"
STATIC AND DY-NAMIC BALANCING MACHINES
balance rotating parts weighing from 4 oz. to 8 tons

Perfex Controls

Save $600.00 per Month

in salaries alone

at Union School Of Christianity
Kansas City, Mo.

All over the country Perfex Industrial Instruments are effecting remarkable savings in fuel, labor, maintenance — like they are at the Union School of Christianity. Here's what they have to say about their Perfex system:

"Since we installed your equipment we have added over 18,000 square feet of new buildings, and still have a saving of 5% on our fuel consumption.

In addition we have saved in labor two extra men's time or about $600 per month in salaries, and have had 24 hour trouble-free heating since installing this equipment."

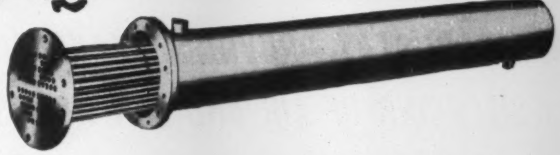
It will pay you too to check on Perfex Industrial Instruments for *your* heating system.

PERFEX

PERFEX CORPORATION
Executive Offices — Milwaukee, Wis.
Plant — Iron Mt., Michigan
PERFEX CONTROLS LTD. Toronto, Ontario, Canada

AUTOMATIC CONTROLS FOR HEATING • AIR CONDITIONING • APPLIANCES

Look inside a Taco HEAT EXCHANGER



You'll see why you get better performance . . .

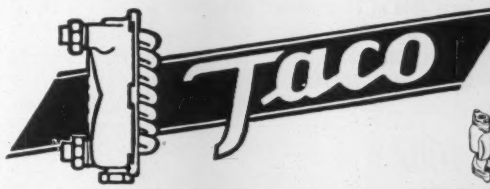
- Electronically rolled, expanded joints . . . permanently leakproof.
- Tubing held rigidly apart by separators . . . no rubbing, no noise, no wear.
- Baffling engineered for rapid heat transfer . . . maximum operating efficiency.
- Head passes designed for free flow . . . minimum pressure drop.

Taco HEAT EXCHANGERS

. . . engineered to fill *your* requirements

Taco Field Engineers have the experience and technical "know-how" to help you select exactly the right Heat Exchanger for conditions to be met: flow, velocity, temperature rise, log mean temperature difference, pressure drop, transmission rate, and steam pressure or temperatures of other heating media.

For complete information, write for "Taco Heaters" catalog containing Taco's "pin-point" Selection Charts.



Circulating Pumps

TACO HEATERS, INCORPORATED
137 South Street
Providence 3, R.I.

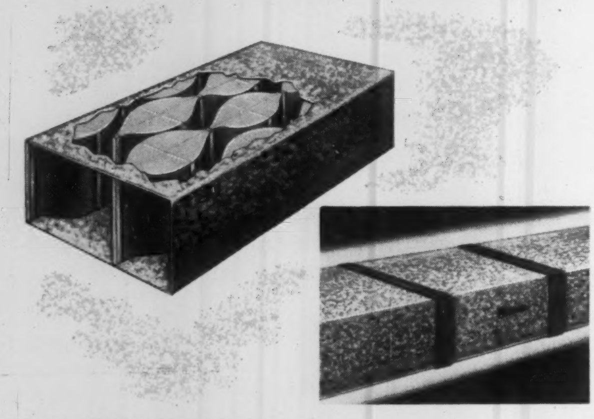
Tank Heating Units

Condensate Coolers
Converters
Fuel Oil Heaters
Oil Coolers
Radiation Heaters
Water Heaters

Chillers

AT LAST . . . THE ANSWER TO AIR CONDITIONING NOISE

AIRCOUSTAT PROVIDES PACKAGED SILENCING OF AIR AND FAN NOISES



CHECK THESE ADVANTAGES:

✓ 7 foot unit reduces noise level below what 100 feet of duct lining could accomplish.
✓ Pressure drop less than lining entire duct.
✓ Selection is no problem. If it fits geometrically, it fits acoustically.
✓ Easy to install. Only simplest tools needed.
✓ Constructed of galvanized steel or aluminum for long-life durability.
✓ Available in 11 standard sizes from 6" x 6" to 48" x 56" for use with all styles and sizes of ducts.
✓ Acoustically engineered to assure correct silencing of conditioned areas.

WRITE TODAY FOR COMPLETE SPECIFICATIONS

INDUSTRIAL SOUND CONTROL, Inc.
45 Granby St., Hartford, Conn.
Please send me more information on AIRCOUSTATS.
Name
Address
City State

SILENCE SERVICE
Industrial Sound Control Inc.
45 Granby Street, Hartford 12, Conn.

MEETINGS & CONVENTIONS...

OIL HEAT INSTITUTE OF AMERICA, INC., 500 Fifth Ave., New York 36—32nd annual convention, May 16-20, to be held concurrently with the 1954 National Indoor Comfort Exposition. Both events will be held at the Commercial Museum, Philadelphia.

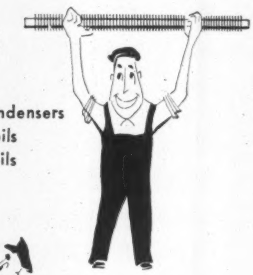
Exhibitors of heavy oil burning equipment will invite architects and engineers to a special session to be held in the Commercial Museum on Wednesday, May 19, between 5 and 7 p.m. Experts on heavy fuel oil handling and combustion will be the speakers for this occasion.

GAS APPLIANCE MANUFACTURERS ASSOCIATION, 60 E. 42nd St., New York 17—19th annual meeting, May 19-21, Drake Hotel, Chicago. Theme of the meeting is "Programmed Action for Profit."

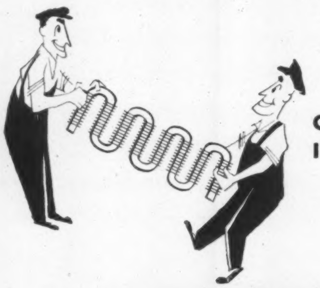
HEATING, PIPING AND AIR CONDITIONING CONTRACTORS NATIONAL ASSOCIATION, Suite 1843, Rockefeller Plaza, New York 20—65th annual convention, May 24 to 28, Hotel Traymore, Atlantic City, N. J.

NATIONAL DISTRICT HEATING ASSOCIATION, 827 N. Euclid Ave., Pittsburgh 6—45th annual meeting, May 25-28, The Greenbrier, White Sulphur Springs, W. Va. John F. Collins, Jr., is secretary-treasurer.

go to a *SPECIALIST* for helical finned heat transfer tubing



- straight lengths
- compact coils for refrigeration condensers
- blast air heating coils
- blast air cooling coils



OVER 100 SIZES IN PRODUCTION

Made to your individual specifications!

ROME
TURNEY RADIATOR COMPANY
209 CANAL STREET ROME, NEW YORK

TVC *Condensate Pumps*

LOW PRESSURE SYSTEM

LOW RETURN CONNECTION
LOW SPEED, LONG LIFE
CAST IRON RECEIVER
SINGLE OR DUPLEX

A SINGLE UNIT easily converted at any time to a DUPLEX UNIT

Specify the "Convertible" TVC in the 15 gallon receiver when ordering low pressure system condensate pumps.

Capacities from 500 to 10,000 sq. ft. E.D.R.

Available from Jobbers' Stocks

The Single Unit TVC Condensate Pump in a 15 gallon receiver can be converted to a DUPLEX UNIT whenever load or other conditions require. Each receiver is furnished machined and drilled for the addition of another pump and control.

Conversion to a Duplex Unit doubles the capacity of the unit, or where desired, provides a stand-by pump. Additional pump is installed right on the job. Removal of the unit is unnecessary.

- **Dimensions**

15 gallon cast iron receiver for single or duplex units: diameter 25½", height of return above floor—7$\frac{3}{16}$".
10 gallon cast iron receiver (for single units only): diameter 21", height of return above floor—6⅞".

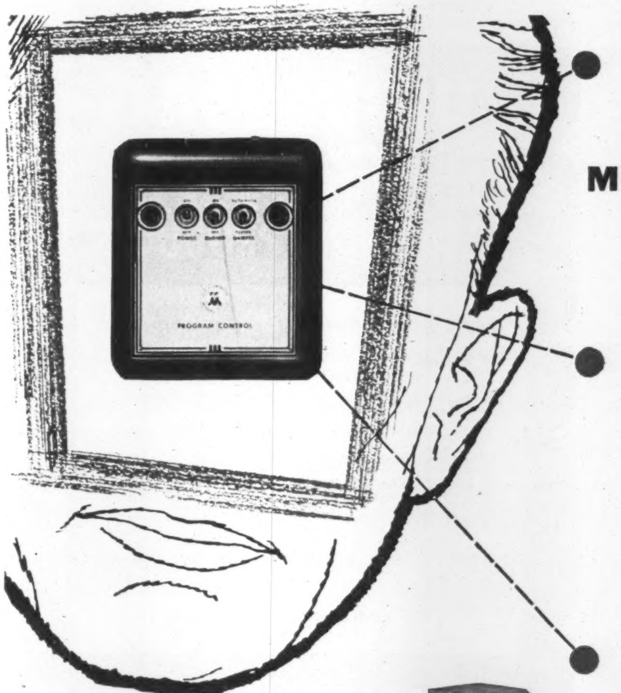
- **Features**

TVC Condensate Pumps are low speed (1750 RPM) for long life, are readily installed in area where space is important. Their compact cast iron receiver and sturdy pumping unit assure a trouble free installation.

- **Installation**

Simple installation consists of connecting return line to receiver, and connecting discharge to boiler, using a check valve and a gate valve. Unit is completely assembled at the factory. Send for Bulletin TVC300.

weil PUMP CO. 1514 N. FREMONT ST. • CHICAGO 22



Like a "magic brain"...

COMBUSTIONEER'S

Modulating Controlled Stokers

SAVE FUEL! SAVE TIME! SAVE MONEY!

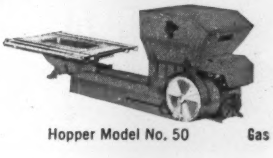
Combustioneer's "magic" Modulating Controls level off peaks and valleys in coal feeding, prevent over-firing and waste of coal! They keep more heat in the boiler . . . reduce stack losses . . . use less fuel during "off" periods . . . save operator's time . . . assure smoke-free stacks. They accomplish all this by *automatically* feeding coal and air to the fire at *variable* rates to meet exact load requirements.

Combustioneer Hopper and Bin-Feed Stokers range in capacity from 9 to 1000 lbs. per hour. Their rugged construction gives long life in hard service.

Write today for Architect's Heating Manual containing complete Combustioneer data and specifications.

Combustioneer Division
The Steel Products Engineering Company
1352 W. Columbia St., Springfield, Ohio

Bin-Feed Model No. 15



Hopper Model No. 50

Combustioneer

Gas Burners • High and Low Pressure Oil Burners • Oil Furnaces • Stokers • Humidifiers

Residential
AIR
CONDITIONING
Without Water!

UNICON
by KRAMER

A Remote Type Air-Cooled Condenser that completely eliminates water, sewerage and plumbing problems.

SPECIFICALLY DESIGNED FOR RESIDENTIAL APPLICATION

Unusually Quiet!

WRITE FOR BULLETIN No. U 250

KRAMER TRENTON CO.
Trenton 5, N.J.

MEETINGS & CONVENTIONS

Continued

1954 *NATIONAL PLASTICS EXPOSITION*, sponsored by the Society of the Plastics Industry Inc., 67 W. 44th St., New York 36—technical conference and exposition, June 7-10, Public Auditorium, Cleveland. Refrigeration and air conditioning manufacturers will take part in the program.

ILLINOIS INSTITUTE OF TECHNOLOGY, two week refresher course in "Basic Oil Hydraulics," June 7-18. The course is designed for maintenance technicians and others already working in the hydraulics field.

Further information about the summer course may be obtained from the Dept. of Mechanics, IIT, 3300 S. Federal St., Chicago 16.

AMERICAN SOCIETY FOR TESTING MATERIALS, 1916 Race St., Philadelphia 3—annual meeting, June 13-18, Sherman and Morrison Hotels, Chicago. The meeting will include the Eleventh Exhibit of Testing and Scientific Apparatus and Laboratory Supplies and the Ninth Technical Photographic Exhibit.

AMERICAN SOCIETY FOR ENGINEERING EDUCATION—62nd annual meeting, June 14-18, University of Illinois, Urbana.

UNIVERSAL
Flexible
METAL HOSE PRODUCTS

For all industrial requirements

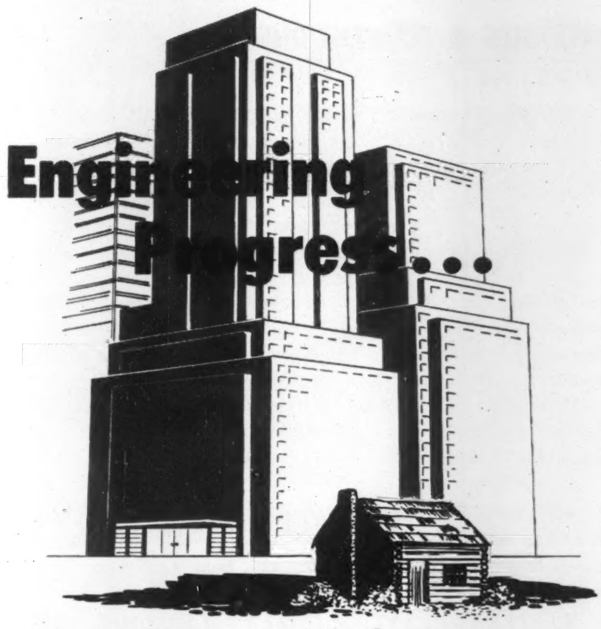
- **Exhaust**
- **Suction**
- **Pressure Hose**
- **Blower Hose**
- **Fume Collection**
- **Fittings**

METALS: Galvanized Steel, Stainless Steel, Bronze and Brass.

Send for Technical Data Book U-111

(No obligation, of course)

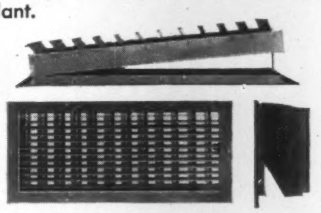
UNIVERSAL METAL HOSE CO.
2117 South Kedzie Avenue
Chicago 23, Illinois



Your guarantee of Top Performance in Stewart

REGISTERS and GRILLES

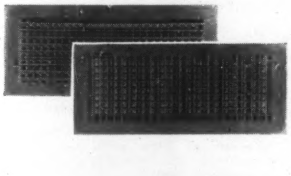
When you specify the Stewart line, you specify uniformly high quality, and dimensional accuracy in every air conditioning outlet manufactured in our plant.

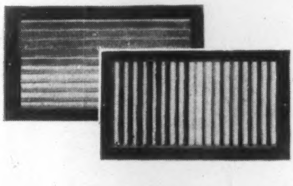


Available in more than 50 styles and in 2100 sizes; all of which are not only pleasing to the eye, but also designed to strict engineering principles that provide every feature demanded by this fast growing market.

One of the outstanding features is the new opposed-action valve. This unit provides positive damper setting in any position and gives uniform air distribution over the entire face of the register.

Your inquiries are solicited. Send for the new Catalog No. 54 showing our entire line and its many plus values.





Stewart **MANUFACTURING CO., INC.**
Grove Ave., Essex County, Cedar Grove, N. J.

2339

Sales Representatives in the Principal Cities of United States, Canada and the West Indies.

BRIEFS
from The YEOMANS GUARD

Pump Bearings Now Immune to Ashes, Sand, Emery Dust & Iron Filings

Here is an effective answer to bearing failures in vertical wet-pit centrifugal pumps — the Lubri-Vac® System. By providing positive lubrication of the radial bearing, Lubri-Vac has reduced bearing failures and pumps servicing by 95%.

Lubri-Vac has been tested under field operating conditions for more than two years; and in the laboratory it has met even more grueling conditions, by pumping a solution of 3000 p.p.m. abrasive content—60% coarse beach sand, 20% ashes, 15% iron filings and 5% emery dust!

Performance like that shows why we have made Lubri-Vac standard equipment on all Yeomans vertical wet-pit centrifugal pumps.

There's a new bulletin with design and laboratory test data, the complete Lubri-Vac story—sent on request. ® Registered Trade Name.

® Registered Trade Name.

☐ ***Send Lubri-Vac Bulletin***

* * *

"PACKEX"
It's new, pneumatic, low-capacity, high-efficiency, self-contained . . .

The new "Packex" was designed for those customers who want traditional Yeomans pneumatic ejector dependability in a lower-capacity unit. "Packex" gives you that desired dependability.

Further, it's a self-contained "package" — needs only a 4-½ ft. diam. circle of floor space; has its own air compressor, mounted on top; has a nominal capacity rating of 20 g.p.m. at 20 Ft. head . . . and is agreeably low in price.

If small quantities of solids-bearing liquids are causing you big headaches, we suggest you check the box below.

☐ ***Please send new "PACKEX" Bulletin.***

* * *

What To Look For *(And Get)* In A Cellar Drainer

All cellar drainers and small sump pumps operate the same way and look much alike—and there as a rule, the similarity ends.

We are wholly convinced that there is only one cellar drainer worth buying—and we make it. That conviction is confirmed by scores of big industrial buyers who have standardized on Yeomans, knowing that its heavy duty construction means years of dependable service, which more than offsets the higher original investment. The fact is that year after year, many Yeomans Cellar Drainers are sold to irate citizens and industrial buyers who bought cheaper pumps and lived to regret it. The pumps clogged, or the controls stuck, or impellers rusted—no pumps, flooded basements. After perennial exasperation and damage and excessive cost, a Yeomans Cellar Drainer is installed—and that literally is the end of the matter.

This Yeomans Cellar Drainer is built like a heavy-duty Yeomans municipal pump. It will not clog. Its impeller will not rust. Its dependable control will not stick. You just install it—and forget it.

There's more, of course—a bulletin for the asking; but it all leads to the same wholesome and inevitable conclusion.

☐ ***Please send Cellar Drainer Bulletin***

The Yeomans Guard, our periodical, containing news and helpful information on pump selection, applications and maintenance is available on request from your local Yeomans Representative (listed in the telephone book Yellow Pages under "Pumps") . . . or check box below and mail this advertisement to us. Be sure to give us your name, company name and address.

☐ **Send current issue of "The Yeomans Guard."**

YEOMANS BROTHERS COMPANY

2001-5 N. Ruby St., Melrose Park (Chicago), Illinois

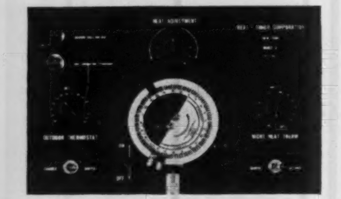
HEAT-TIMER GUARANTEED* Heating Controls and Valves

***guaranteed, unconditionally,**
TO INCREASE HEATING EFFICIENCY;
REDUCE FUEL COSTS as much as 40%;
MAKE SYSTEMS FULLY AUTOMATIC.

No heating installation is fully automatic without

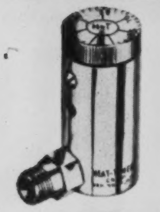
HEAT-TIMER ELECTRONIC CONTROL

Automatically times heat supply to outdoor weather; provides 24-hour electronic precision control; starts and shuts off heat as needed. Saves hours of fuel waste; cuts heating costs as much as 40%.



The Heat-Timer Electronic Outdoor Weatherhead signals temperature changes as slight as 1 degree.

HEAT-TIMER RADIATOR AIR VALVES



solve the heat distribution problems on 1-pipe steam systems.

HEAT-TIMER THERMOVALVE dials for exact temperature desired in any room. Saves fuel in rooms that tend to overheat. No interference with existing controls. Angle or straight shank.

Precision-made: long-life, brass chromeplated; yet cost little more than ordinary radiator air valves.

HEAT-TIMER VARIVALVE gets heat fast to remote radiators, mains and risers. Stops unnecessary overheating and fuel waste. Venting orifice variable 0" to 5/16". No hissing, clicking or spitting. Angle or straight shank.

HEAT-TIMER MOTORIZED VALVES

High- or low-pressure, pilot-operated and 3-way. Iron or brass body.

Completely automatic, in sizes to fit any steam main. Used extensively, also, for control of ventilating and air conditioning systems and control of mediums to coils of sprays in processing and other industrial applications. Controls flow of any non-corrosive steam or liquid.

Write for full details on specific products.

HEAT-TIMER CORP'N
657 Broadway, New York 12 - AL 4-5380
Mfrs. of HEAT-TIMER Electronic Controls, Thermovalves, Varivalves, Motorized Valves; Smoke-Eye Smoke Alarm; Fire-Chief Fire Alarm and other outstanding products.

AMERICAN SOCIETY OF HEATING AND VENTILATING ENGINEERS, 62 Worth St., New York 13—Semi-Annual Meeting, June 28-30, New Ocean House, Swampscott, Mass.

HEAT TRANSFER — two week summer course at Massachusetts Institute of Technology on modern developments in heat transfer, July 6-16. The course will cover fundamental concepts and recent findings in the field of heat transfer. It has been designed to fill the needs of teachers, research workers and development engineers.

Tuition for the course is $160. Application blanks and further information are available from the Summer Session Office, Room 7-103, MIT, Cambridge 39.

AMERICAN SOCIETY OF REFRIGERATING ENGINEERS, 234 Fifth Ave., New York 1—41st semi-annual meeting, July 11-14, Hotel Olympic, Seattle, Wash.

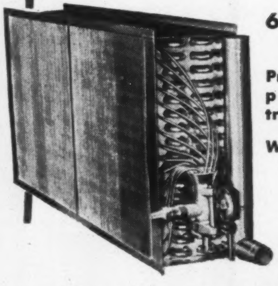
WESTERN PLANT MAINTENANCE SHOW, 759 Monadnock Bldg., San Francisco 5—West's first plant maintenance show, July 13-15, at the Pan Pacific Auditorium, Los Angeles. Produced by Clapp & Poliak, Inc., the show will emphasize the specialized problems of maintenance and engineering faced by western industry which has undergone tremendous expansion since World War II.

Air Cooling COILS
2 to 15 Ton CAPACITY

NEW Complete Line

REMPE

COMPLETE WITH MULTI-OUTLET EXPANSION VALVES MADE-ON— READY TO INSTALL



4 Row Coils — for residential jobs.

6 Row Coils — for commercial jobs.

Precision built to insure top performance and to give trouble-free service.

Write for bulletins and prices.

Complete facilities for fabrication of pipe coils — all types — all materials. Engineering service. Send details for price.

A request on your letterhead will bring free copy of New Engineering Data Book on Pipe and Fin Coils.

HEAT TRANSFER EQUIPMENT REMPE CO. Founded 1890

REMPE COMPANY
342 N. Sacramento Blvd., Chicago 12, Ill.

Gravity roof ventilation an aid in restricting FIRE LOSS

Swartwout AIRMOVER

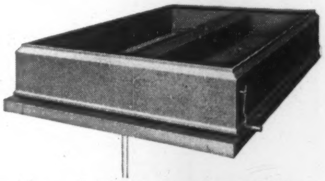
with fusible link damper release . . . a valuable safety factor

The Livonia* fire taught an important lesson. Confined smoke and fumes prevented firemen from locating flame sources — cancelled efforts to keep fire from spreading. Large scale Swartwout Airmover roof ventilation would have released heat and dense oily smoke — *fast* — allowing more effective fire-fighting.

Airmover provides everyday economical roof ventilation adaptable to any type of building. Only 32 inches high, air travel is short, with practically no air friction. Fully weatherproof, with adjustable dampers. As a fire hazard provision, dampers can be weighted to open fully when an approved type fusible link releases operating bar. Investigate this valuable safety aid. Write for Bulletin AM-F.

** Livonia, Mich. — General Motors Hydramatic plant. See article in November "Fortune".*

. . . and now the FIRE VALVE



Designed for quick release of heat, smoke and gases in case of fire. Two large dampers drop open when high temperature melts fusible link. Provides 46 sq. ft. free opening. Only 21 in. high. Weatherproof when closed. Also serves as emergency ventilator. Write for details.

18511 Euclid Avenue, Cleveland 12, Ohio

The Swartwout Co.

Roof Ventilators and Ventilating Louvers

POWER PLANT EQUIPMENT • PROCESS INDUSTRY CONTROLS

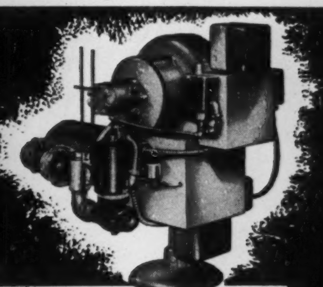
Now! A DUAL FUEL BURNER

Engineered To Insure Peak Efficiency With Both Fuels

GAS and OIL

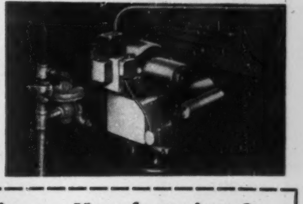
Siemon Power Combi-Matic Burner
employs the forced-draft principle
for firing on both gas and oil.

SIEMON Bonus Built* Burners



offer more to you . . more to your customers.

*Bonus Built Features...	Give You These Advantages
Factory Assembled	Less installation time required.
Factory Tested—for Both Gas and Oil	Insures top "on the job" performance.
Automatic Air Adjustment	Just set it . . . forget it . . .
Motorized Gas Valve	Quiet start-ups; actuates air dampers to correct position.
Automatic Ignition Transformer	Automatic ignition for BOTH fuels.
Uses Standard Controls	Parts always accessible immediately.
Electronic safeguard	Immediate response to flame interruption.
Pressure Safety Control	Prevents opening of either fuel valve unless fan is running and pump pressure proven.
Optional Automatic or Manual Changeover	Will switch automatically from outside temperature or by the flip of a switch.



Model FGO-2200-E
Boiler fired at 2,000,000 B.T.U. input—gas and oil installation in a large Midwestern paper distributing plant

Siemon Power Combi-Matic
DUAL FUEL BURNERS

Siemon Manufacturing Co.
1819 Holmes, Dept. A Kansas City, Mo.
Please rush literature and "profit plan" details about your Forced Draft Dual Fuel Burner.

Name____________________

Company____________________

Address____________________

City__________Zone_____State______

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Heating and Air Conditioning Equipment

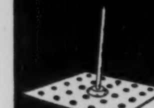
CORNISH makes the
WIRED ASSEMBLIES
to speed up your production

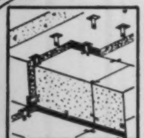
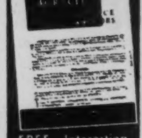
Through integrated engineering and production control from rod mill to molding, we produce complete QUALITY units at lower cost ———

"MADE BY ENGINEERS FOR ENGINEERS"

CORNISH-RUTLAND COMPANY
Rutland, Vermont

FOR
SPEED AND ECONOMY
INSULATE
WITH
Miracle
SURFACE ANCHORS AND ADHESIVES



Miracle Surface Anchors bonded with Miracle Adhesives provide firm anchorage for all types of Insulation. This includes Batt, Fiber Glass, Foam Glass, Cork, etc. to ducts, walls, or ceilings. No drilling, welding, bolts, screws or other mechanical means of attachment required. Miracle Surface Anchors are available in a variety of shapes and sizes to accommodate the particular job, and have been endorsed by leading Insulation Contractors and Architects everywhere because of their labor and time saving features. For information write:

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MIRACLE ADHESIVES CORP.
214 E. 53rd St., New York 22
For anchors write
DEVICES, INC.
214 E. 53rd St., New York 22

FREE: Interesting, colorful brochure on "miracle surface anchors"! Write for your copy today.

MEETINGS & CONVENTIONS

Continued

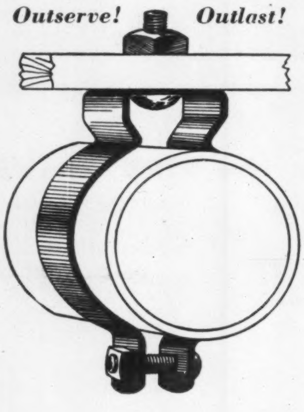
The *NATIONAL WARM AIR HEATING AND AIR CONDITIONING ASSOCIATION*—remaining short course in the 1954 series will be held July 13-16 at the University of Wisconsin. Tuition is $25. Further information is available from Prof. R. C. Tegtmeyer, Mechanical Engineering Dept., Madison.

INSTITUTE OF BOILER AND RADIATOR MANUFACTURERS, 62 E. 42nd St., New York 17— short courses in boiler heating at Purdue University and the University of Illinois. The short course in hot water and steam heating at Purdue will be held during the week of July 19. It will be an elementary course emphasizing the principles of design and installation based on the I-B-R installation guides.

The short course at Illinois is scheduled for the week of July 26. It will be an advanced course with emphasis on summer cooling in connection with hot water and steam heating systems.

INTERNATIONAL INSTRUMENT CONGRESS AND EXPOSITION, 845 Ridge Ave., Pittsburgh 12. A number of professional societies are participating in making plans for the meeting to be held in Philadelphia. Technical sessions are scheduled to begin September 13 and continue until September 25.

MINERALLAC
Steel HANGERS, CLIPS, STRAPS


Outserve!
Outlast!

Minerallac Cable, Conduit and Messenger Hangers are STEEL. Easier, quicker to install; permit speedy, compact wiring; economical. Also in Everdur . . . Porcelain insulating Bushings available.

Jiffy STEEL Clips (Pipe-clamp) require only one screw, nail or bolt; rib-strengthened; for hanging pipe, conduit, BX cable, mounting coils, etc. Millions in use.

Steel Straps for Messenger-cable services on outlet boxes; may be used in conjunction with hangers.

Order from your Electrical Wholesaler. Send for literature.

MINERALLAC ELECTRIC COMPANY
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KEYNOTES

"Assembly's so fast with Key-Tite, I need Oscar here to keep up with me!"

BRAM
KEY-TITE
WATER PROOF
PIPE JOINT
COMPOUND

The perfect sealer for pipes carrying water, gas, low-pressure steam.

Write for FREE sample.

SEALS TIGHT... BREAKS RIGHT!

A Product of KEY COMPANY
2617 McCasland • East St. Louis, Illinois

A LOT OF PUMP IN A LITTLE PACKAGE!

BJ NEW FRACTIONAL HORSEPOWER BILTON PUMPS

...WITH BJ MECHANICAL SEAL AS STANDARD EQUIPMENT!

Meet the mighty midgets of the BJ Bilton family. They offer capacities up to 100 GPM and heads up to 100 ft.... yet the largest measures only 16 inches in length! Mount in any position... need no base plate... pump case may be rotated for horizontal or vertical discharge... no stuffingbox problems. Temperatures to 150° F and suction pressures to 75 psi can be handled. Quick delivery.

APPLICATIONS:

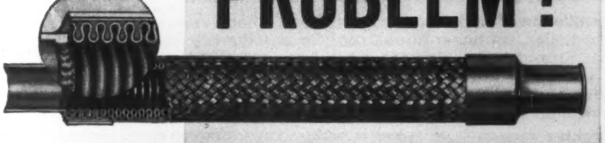
- *Air conditioning*
- *Marine*
- *Swimming pools*
- *Building service*
- *Refrigeration*
- *Coolant oil*
- *Car washing*
- *Fire protection*
- *and countless other general purpose pumping jobs*

Byron Jackson Co. PUMP DIVISION

P. O. Box 2017, Terminal Annex
Los Angeles 54, California

Quality Pumps Since 1872

VIBRATION PROBLEM?



ENGINEERS AND SERVICEMEN! Are you confronted with vibration and noise problems in compressor lines? If so, specify PACKLESS Flexible Vibration Absorbers for the answer. Size range to fit 1/4" O.D.—10 1/8" O.D. copper tubing.

Write for Bulletin VA-3

PACKLESS
METAL HOSE INC.

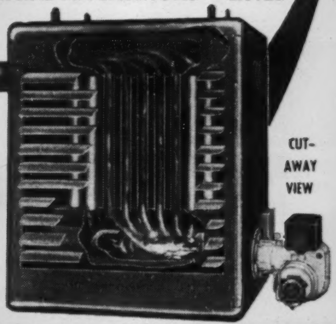
31-12 WINTHROP AVE., NEW ROCHELLE, N. Y.

AUTOMATIC D HEATING

NOW—THE WORLD'S FIRST! Delta's NEW OIL-FIRED UNIT HEATER*

220,000 BTU/HR OUTPUT • GUN-TYPE OIL BURNER • 5,730 CFM AIR DELIVERY • THROWS HEAT 75 FEET • SUSPENDS OVERHEAD • EXTREMELY ECONOMICAL OPERATION • RUGGED CONSTRUCTION • FACTORY PRE-WIRED & ASSEMBLED • ADJUSTABLE LOUVRES • SUMMER AIR CIRCULATION • EASILY MADE PORTABLE • 59 COMMERCIAL APPLICATIONS • LISTED BY UNDERWRITER'S LABORATORIES

Send for full details

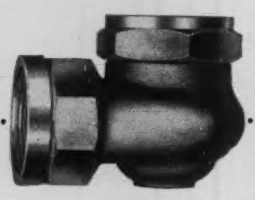


*Patents Pending

SEE OUR OPERATING DISPLAY AT THE OHI EXPOSITION - BOOTHS 151-153 PHILADELPHIA MAY 16-20

DELTA HEATING CORPORATION, TRENTON 8, NEW JERSEY
In Canada Kresno-Stamm • Montreal 24, Canada

SPRAYING SYSTEMS CO.



for lower cost

and better performance

SPRAY NOZZLES

Modern design. Precision machining. All materials. Thousands of standard industrial spray nozzle types and sizes to choose from. Years of proved experience at your service.

SPRAYING SYSTEMS

write for this great new catalog today

Ask for our new 48 page Catalog No. 24 . . . the most comprehensive spray nozzle catalog ever produced. Yours for the asking.

SPRAYING SYSTEMS CO.
3219 Randolph Street • Bellwood, Illinois

MEETINGS & CONVENTIONS

Continued

EIGHTH NATIONAL CHEMICAL EXPOSITION, The American Chemical Society, Chicago Section, 86 E. Randolph St., Chicago 1—Chicago Coliseum, October 12-15. Theme of the exposition is "The Chemical Industry in Everyday Living."

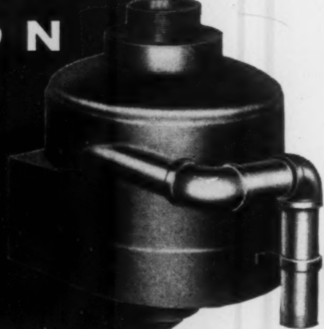
FIRST INTERNATIONAL AUTOMATION EXPOSITION, 845 Ridge Ave., Pittsburgh 12—exhibit on automatic machines, factories and industries to be held the week of November 29 at the 242nd Coast Artillery Armory, 14th St. off Sixth Ave., New York.

The exhibit is under the direction of Richard Rimbach.

21st *NATIONAL EXPOSITION OF POWER AND MECHANICAL ENGINEERING*, under the management of the International Exposition Co., 480 Lexington Ave., New York 17—Commercial Museum, Philadelphia, December 2-7.

INTERNATIONAL HEATING & VENTILATING EXPOSITION—The Air Conditioning Exposition, January 24-28, 1955, Commercial Museum & Convention Hall, Philadelphia. Under the auspices of the American Society of Heating and Ventilating Engineers, and under the management of the International Exposition Co., 480 Lexington Ave., New York 17.

WILSON CENTRIFUGAL BLOWDOWN SEPARATORS



Write for Bulletin 30. Gives complete details and simple installation diagrams.

Solve Blowdown Problems

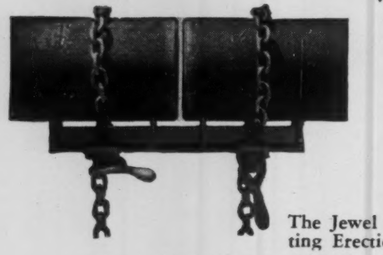
—NO TANKS NEEDED!

Wilson Centrifugal Blowdown Separators permit direct drainage of boiler blowdown to sewer, or other disposal, at atmospheric pressure. Flash steam and pressure are relieved through a large vent without entrapped water or objectional noise.

Installation of separators can be made wherever convenient—at the boiler, on boiler house roof, or outside the boiler house walls. Size of boiler blowdown connection determines which of two models (shown in Bulletin 30) is required. Separators are used, instead of blowdown tanks, in 47 states, foreign countries, and overseas military bases.

WILSON ENGINEERING CORPORATION
122 So. Michigan Ave., Dept. H-5, Chicago 3, Ill.

PIPE WELDING TOOLS THAT MAKE WELDING PAY



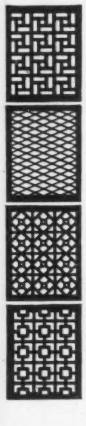
- Pipe Clamps
- Flange Clamps
- Elbow Clamps
- Angle Clamps
- Pipe Markers

TWO SIZES
½ to 8 in. 8 to 16 in.
Light—Adjustable—Fast

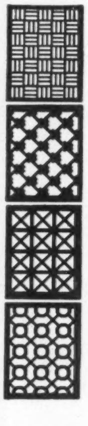
The Jewel System of Pipe and Fitting Erection Ready for the Weld

Keeps the Welder Welding Instead of Waiting
CUTS ERECTION COSTS
Modernize Your Own Methods and Tool Equipment

JEWEL MANUFACTURING COMPANY
1841 University Ave., St. Paul, Minn.



DIAMOND GRILLES
TRADE MARK



Look Better — Last Longer

Superior workmanship and finish in heavy-gauge metal assures installations of lasting beauty. Most designs stamped in any thickness, up to one-fourth inch, from any metal. Catalog No. 36 illustrates all designs and gives complete working data. Free on request.

Diamond Manufacturing Co.
Box 45 Wyoming, Pa.

Sales representatives in all principal cities

FOR EVERY HEATING INSTALLATION
STEDCO
HI-therm
RADIATION
DISTRIBUTORS WANTED — WRITE —
STEDCO PRODUCTS
KINGSTON, PENNA.
WILKES BARRE, PENNA.

JRS
®
New design and mechanical patents pend-
DON'T be a CHISELER
30 SECOND Job
with a JRS-TALON
Cut 4" DURIRON and other ACID
RESISTING PIPE
in 30 seconds
GUARANTEED, NO SPLITS, NO BREAKS
HEADED FOR THE SCRAP HEAP....
TALON TOOLS
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N. Arlington, N. J.
MORE INFO.- CLIP TO YOUR LETTERHEAD AND MAIL TO

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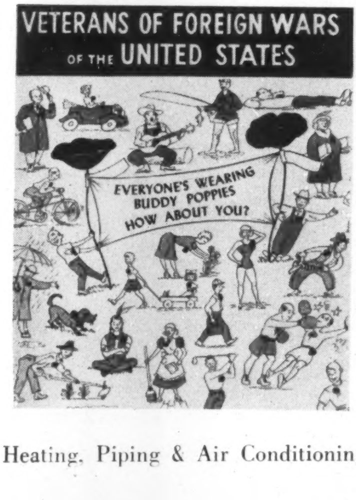
Classified Section: Rates for classified advertising are 12 cents for each word, including heading and address. One inch $6.00. Count nine words for keyed address. Minimum $2.00 for each insertion. Cash must accompany order.

situations wanted . . .

Project Engineer, M.S., experienced in combustion, air conditioning and gas heating appliances. Good background in thermodynamics, fluid flow, and heat transfer. Married, family. References. Desire position of responsibility. Address Key 1092A, Heating, Piping & Air Conditioning, 6 North Michigan Avenue, Chicago 2, Ill.

PRODUCT DEVELOPMENT ENGINEER — Relocating south, midwest, or southwest. Eleven years heat transfer research and development experience in petroleum, aircraft, commercial heating, and air conditioning industries. Activities have included wet and warm air heating products and room and residential air conditioning. Address Key 1091A, Heating, Piping & Air Conditioning, 6 North Michigan Avenue, Chicago 2, Ill.

HEAT TRANSFER ENGINEER — Outstanding experience of research in heat transfer, refrigeration, and heating; holds B.S., M.S. and Ph.D. in Mech. Eng.; seeks responsible position in research or development engineering. Write Key 1095A, Heating, Piping & Air Conditioning, 6 North Michigan Avenue, Chicago 2, Illinois.



VETERANS OF FOREIGN WARS OF THE UNITED STATES
EVERYONE'S WEARING BUDDY POPPIES HOW ABOUT YOU?

situations open . . .

SALES MANAGER — Well established Eastern manufacturer of wrenches and plumbing tools is seeking a sales manager to handle national distribution. Company uses agents to sell through distributors and jobbers. Must have merchandising experience in associated fields, as job entails complete responsibility for development and execution of company marketing programs. Prefer supervisory sales experience. Attractive salary arrangements. Your full reply treated in confidence. Address Key 1094A, Heating, Piping & Air Conditioning, 6 North Michigan Avenue, Chicago 2, Ill.

MECHANICAL ENGINEER — Experienced in design of heating, ventilating and air conditioning systems for commercial and industrial type structures. Must be able to develop designs, contract plans and specifications to meet exacting standards. Permanent employment proffered in conveniently situated air conditioning office. In reply give full particulars regarding experience, salary, and when available. CLARK & BUHR & NEXSEN, ARCHITECTS-ENGINEERS, P. O. Box No. 9628, Norfolk, Virginia.

MECHANICAL ENGINEER for general building contractor. Excellent opportunity and permanent position with young, expanding company. Must be capable of estimating and analyzing subbids received from mechanical and electrical subcontractors and supervise and expedite work after subcontract awarded. Write full particulars, including education, experience, personal details, and salary requirements to: BLOUNT BROTHERS CONSTRUCTION COMPANY, Post Office Box 1144, Montgomery, Alabama.

agents wanted . . .

Manufacturers' Agents wanted — automatic control valve manufacturer, pressure reducing, temperature regulating, diaphragm control valve, desires exclusive sales representative in open territory. Want agents to call on industrials, institutions, mechanical contractors, wholesalers, and consulting engineers. Address Key 1090A, Heating, Piping & Air Conditioning, 6 North Michigan Avenue, Chicago 2, Ill.

The Adams Manufacturing Company, manufacturer of a complete line of top quality gas conversion burners, has territories open in most major trading areas. Exceptional opportunity for aggressive sales representatives to contact dealers and jobbers exclusively. Give full particulars on territory coverage and financial responsibility. Write Don C. Zinter, Sales Manager, The Adams Mfg. Company, 1530 St. Clair Avenue, Cleveland 14, Ohio.

wanted . . .

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Established Mfr's. Agents, New York area, wish to add to present line a major line of heating, ventilating or air conditioning equipment. Twenty-five years experience, good reputation, identified with many major projects. Contacts among Engineers, Contractors and Industrials. If interested, forward information pertaining to your product. Address Key 1077A, Heating, Piping & Air Conditioning, 6 North Michigan Avenue, Chicago 2, Ill.

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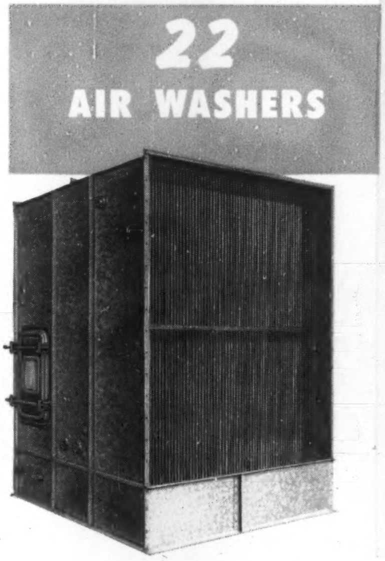

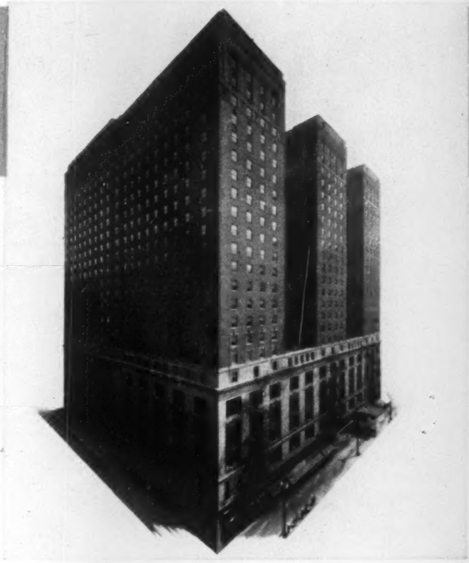

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T-271 Heating-Cooling Thermostat for Room Air Conditioning Units

D-251 Piston Damper Operator

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